وزارة التعليم العالي والبحث العلمي
جـــهاز الإشـــراف والتقـويم العلـمي
دائرة ضمان الجودة والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

الجامعة : ميسان
الكلية/ المعهد: كلية العلوم
القسم العلمي : قسم الفيزياء
تاريخ ملء الملف : 2021

التوقيع :
اسم رئيس القسم : أ.م.د منذر عبد الحسن خضير
التاريخ : 2021

التوقيع :
اسم المعاون العلمي :
التاريخ :

دقق الملف من قبل
شعبة ضمان الجودة والأداء الجامعي
اسم مدير شعبة ضمان الجودة والأداء الجامعي: م. شيماء ربيع بعنون
التاريخ : 2021/10/10
التوقيع :

مصادقة السيد العميد

وصف البرنامج الأكاديمي

يوفر وصف البرنامج الأكاديمي هذا ايجازاً مقتضياً لأهم خصائص البرنامج ومخرجات التعلم المتوقعة من الطالب تحقيقها مبرهناً عما إذا كان قد حقق الاستفادة القصوى من الفرص المتاحة . ويصاحبه وصف لكل مقرر ضمن البرنامج

1. المؤسسة التعليمية	جامعة ميسان
2. القسم العلمي / المركز	كلية العلوم
3. اسم البرنامج الأكاديمي او المهني	قسم الفيزياء
4. اسم الشهادة النهائية	بكالوريوس علوم الفيزياء
5. النظام الدراسي : سنوي /مقررات /أخرى	فصلي
6. برنامج الاعتماد المعتمد	
7. المؤثرات الخارجية الأخرى	لا يوجد
8. تاريخ إعداد الوصف	/ / 2021
9. أهداف البرنامج الأكاديمي	
خدمة اعداد خريجين متخصصين في علوم الفيزياء يساهمون في خدمة التنمية في البلد	
تلبية احتياجات قطاعات متعدده في مجال الفيزياء بكوادر ذات كفاءة عالية	
تشجيع المتميزين في هذا المجال للعمل كمعيدين في القسم ليكونوا اعضاء هيئة تدريسية في المستقبل	
تحقيق الجودة واالعتماد الاكاديمي	

10. مخرجات البرنامج المطلوبة وطرائق التعليم والتعلم والتقييم
أ- الاهداف المعرفية أ1 -تمكين الطالب من الحصول على المعرفة والفهم لمفهوم علوم الفيزياء أ2 -تمكين الطالب من الحصول على المعرفة والفهم للقوانين العلمية في الفيزياء أ3 -تمكين الطالب من مواكبة التطور العلمي في كل المجاالت العلمية الخاصة بعلوم الفيزياء
ب – الأهداف المهاراتية الخاصة بالبرنامج ب 1 – مهارات علمية ب 2 – مهارات االستخدام والتطوير ب 3 - مهرات تفكير وتحليل
طرائق التعليم والتعلم
1 .توضيح وشرح المواد الدراسية 2.تزويد الطلبة بالمعرفة 3 .مطالبة الطالب بزيارة المكتبة للحصول على المعرفة االكاديمية 4 .تحسين اداء الطلبة من خالل تشجيعهم على زيارة المواقع االلكترونية
طرائق التقييم
1. اختبارات يومية من خالل اسئلة متعددة الخيارات 2. وضع درجات للواجبات اليومية 3. وضع درجات مشاركة في االسئلة المنافسة الصعبة
ج-مهارات التفكير ج1 -تمكين الطلبة من التفكير والتحليل للمواضيع المرتبطة بالمادة ج2 -تمكين الطلبة من التفكير والتحليل للمواضيع المتعلقة بقوانين العلوم المدروسة ج3 -تمكين الطلبة من التفكير والتحليل للمواضيع المتعلقة بالمعايير العلمية للدراسة على نطاق العالم
طرائق التعليم والتعلم
1. تزويد الطلبة باالساسيات والمواضيع االضافية المتعلقة بمخرجات التفكير والتحليل. 2. طرح مجموعة من االسئلة التفكيرية خالل المحاضرات مثل)كيف،لماذا،متى،ماالسبب(للمواضيع. 3. اعطاء الطلبة واجبات بيتية تتطلب تفسيرات ذاتية بطرق علمية .

طرائق التقييم
-امتحانات يومية عن طريق اسئلة متعددة الخيارات تتطلب مهارات علمية -امتحانات يومية باسئلة علمية. - وضع درجات للواجبات اليومية.

د -المهارات العامة والتأهيلية المنقولة (المهارات الأخرى المتعلقة بقابلية التوظيف والتطور الشخصي). د1 -تمكين الطلبة من استخدام نماذج واشكال. د2 -تمكين الطلبة من اجتياز مقابالت العمل. د3 -تمكين الطلبة على تطوير ذاتي مستمر بعد التخرج .
طرائق التعليم والتعلم
- تكوين مجموعات نقاشية خالل المحاضرات لمناقشة مواضيع تتعلق بعلوم الفيزياء تتطلب التفكير والتحليل . - تزويد الطلبة باالساسيات والمواضيع المتعلقة بمخرجات التفكير والتحليل
طرائق التقييم
- امتحانات يومية بأسئلة بيتية. - اعطاء درجات محددة للواجبات البيتية .

١١. بنية البرنامج				١٢. الشهادات والوحدات المعتمدة
المستوى / السنة	رمز المقرر أو المساق	اسم المقرر أو المساق	الوحدات المعتمدة	
المرحلة الاولى (الفصل الاول)	PE 103	الكهربائيه Electricity	٣ وحدات	درجة البكالوريوس
	PMe 105	الميكانيك (١) Mechanics I	٣ وحدات	
	PO 101	البصريات(١) optics I	٣ وحدات	
	PMa 107	رياضيات (١) Mathematics I	2 وحدتان	
	PC 109	الحاسبات computers	1 وحدة	
		جيولوجي Geophysics	٢ وحدتان	
		حقوق الانسان Human Rights	٢ وحدة	
	PPP 121	الفيزياء العملية(١) Practical Physics I Mechanics, 2 Electricity ٢) Computers, 2Geophysics ٢)	٤ وحدات	
المرحلة الاولى (الفصل الثاني)		كيمياء تحليليه Analytical Chemistry	٣ وحدات	
	PMg 104	مغناطيسيه Magnetism	٣ وحدات	
	PMe 106	ميكانيك (٢) Mechanics II	٣ وحدات	
	PMa 108	رياضيات (٢) Mathematics II	٢ وحدات	
	PO 102	البصريات(٢) optics II	٣ وحدة	
		علم الفلك Astronomy	٢ وحدتان	
	PPP 122	الفيزياء العملية II Practical Physics II (Mechanics 2 Magnetism 2)	٢ وحدتان	
		اللغة العربية Arabic Language	١ وحدات	
		حرية وديمقراطية Freedom and Democracy	٢ وحدة	
المرحلة الثانية	PAE 209	الكترونيات التماثلية Analog Electronocs	٢ وحدات	

(الفصل الاول)	PAM 205	ميكانيك تحليلي (١) Analytical Mechanics I	٢ وحدات	
	PMa 207	رياضيات (٣) Mathematics III	٢ وحدات	
	PMP 203	الفيزياء الحديث (١) modern Physics I	٢ وحدات	
	PTh 201	ثرموداينمك (١) Thermodynamics I	٢ وحدات	
	PNA 211	تحليل عددي Numerical Analysis	٣ وحدات	
	PPC 213	الكيمياء الفيزياوية I Physical Chemistry I	٣ وحدات	
	PPP 221	الفيزياء العملية I Practical Physics I (٢ Thermodynamics، ٢ Modern Physics، ٢ Analog Electronics)	٣ وحدات	
المرحلة الثانية (الفصل الثاني)	PAM 206	ميكانيك تحليلي (٢) Analytical Mechanics II	٢ وحدات	
	PDE 210	الكترونيات رقميه Digital Ekectronics	٢ وحدات	
	PMa 208	رياضيات (٤) Mathematics IV	٢ وحدات	
	PTH 202	الثرموداينمك (2) Thermodynamics II	٢ وحدتان	
	PMP 204	الفيزياء الحديثه (٢) Modern Physics II	٢ وحدة	
	PPC 214	الكيمياء الفيزياوية (٢) Physical Chemistry II	٣ وحدة	
	PPP 222	الفيزياء العملية II Practical Physics II (٢Thermodynamics ، ٢ Modern Physics، ٢ Digital Electronics(	٣ وحدات	
المرحلة الثالثة (الفصل الاول)	PMa 309	رياضيات (5) Mathematics V	٣ وحدات	
	PMP 311	فيزياء حديثه (٣) Modern Physics III	٢ وحدات	
	PO 301	بصريات (3) Optics III	٢ وحدات	
	PQM 303	الميكانيك الكمي (١) Quantum Mechanics I	٣ وحدات	
	PLP 305	فيزياء الليزر Laser Physics	٢ وحدتين	
	PES 313	موضوع خاص I Elective subjects I	٢ وحدتان	

	٢ وحدات	ميكانيك احصائي (١) Statistical Mechanics I	PSM 307	
	٢ وحدتان	الفيزياء العملية I Practical Physics I (Optics III ٢، Laser Physics ٢ (Micro LabI ٢	PPP 321	
	٣ وحدات	رياضيات (6) Mathematics VI	PMa 310	المرحلة الثالثة (الفصل الثاني)
	٢ وحدات	بصريات (٤) Optics IV	PO 302	
	٣ وحدات	ميكانيك كمي (٢) Quantum Mechanics II	PQM 304	
	٢ وحدات	ميكانيك احصائي (٢) Statistical Mechanics II	PSM 308	
	٢ وحدتان	الليزر في الطب Laser in medicine	PLP 306	
	٢ وحدتان	الفيزياء الجزيئية Molecular Physics	PMoP 312	
	٢ وحدتان	موضوع خاص II Elective subjects II	PES 314	
	٢ وحدتان	الفيزياء العملية II Practical Physics II (Optics IV ٢، (Micro LabII ٢	PPP 322	
	٣ وحدات	الفيزياء الرياضية mathematical physics	PMaP 409	المرحلة الرابعة (الفصل الاول)
	٢ وحدات	فيزياء نوويه (١) Nuclear Physics I	PNP 401	
	٣ وحدات	ميكانيك كمي (٣) quantum mechanics III	PQM 407	
	٢ وحدات	النظرية الكهرومغناطيسية I Electromagnetic Theory I	PET 405	
	٢ وحدات	موضوع خاص (3) Elective Subjects III	PES 411	
	٢ وحدات	مشروع البحث I Research Project I	PRP 413	
	٢ وحدتان	فيزياء الحالة الصلبة I Solid State Physics I	PSS 403	
	٣ وحدات	الفيزياء العملية I Research Project I Practical Physics I (Nuclear Physics ٢، Solid State Physics ٢ (Micro Lab III ٢	PPP 421	
	٢ وحدات	فيزياء نوويه (٢) Nuclear Physics II	PNP 402	المرحلة الرابعة (الفصل الثاني)

	٢ وحدات	فيزياء بلازما Plasma Physics	PPaP 410	
	٣ وحدات	ميكانيك كمي (٤) quantum mechanics IV	PQM 408	
	٢ وحدات	فيزياء الحالة الصلبة II Solid State Physics II	PSS 404	
	٢ وحدات	مشروع البحث (٢) Research Project II	PRP 414	
	٢ وحدات	موضوع خاص (4) Elective Subjects IV	PES 412	
	٢ وحدتان	النظرية الكهرومغناطيسية II Electromagnetic Theory II	PET 406	
	٣ وحدات	الفيزياء العملية (2) Practical Physics II ٢)Nuclear Physics، ٢Solid State Physics ٢Micro Lab IV(	PPP 422	

11.التخطيط للتطور الشخصي
1. و صف كيفية قيام القسم بمتابعة تقدم الطلبة وانجازاتهم ودرجاتهم 2. المشاركة في المؤتمرات العلمية 3. المشاركة في ورش العمل والندوات 4. كفاءات مؤهلة في مجال الرياضيات قد اكتسبوا التفكير المنطقي والمهارات البحثية للتواصل المستقبلي مع المجتمع
12.معيار القبول (وضع الأنظمة المتعلقة بالالتحاق بالكلية أو المعهد)
القبول المركزي –وحسب تعليمات وزارة التعليم العالي والبحث العلمي
13.أهم مصادر المعلومات عن البرنامج
1. المعرفة والفهم 2. مهارات حل المشاكل العلمية 3. مهارات التفكير والتحليل 4. مهارات االستخدامات والتطوير الذاتي 5. تغطية الكادر المتخصص 6. تحقيق الجودة واالعتماد االكاديمي

مخطط مهارات المنهج																					
يرجى وضع اشارة في المربعات المقابلة لمخرجات التعلم الفردية من البرنامج الخاضعة للتقييم																					
			مخرجات التعلم المطلوبة من البرنامج																		
السنة / المستوى	رمز المقرر	اسم المقرر	أساسي أم اختياري	المعرفة والفهم				المهارات الخاصة بالموضوع				مهارات التفكير				المهارات العامة والمنقولة (أو) المهارات الأخرى المتعلقة بقابلية التوظيف والتطور الشخصي					
				أ١	أ٢	أ٣	أ٤	ب١	ب٢	ب٣	ب٤	ج١	ج٢	ج٣	ج٤	د١	د٢	د٣	د٤		
السنة الاولى	PE 103	الكهربائيه Electricity	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
	PMe 105	الميكانيك (١) Mechanics I	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
	PO 101	البصريات(١) optics I	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
	PMa 107	رياضيات (١) Mathematics I	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
	PC 109	الحاسبات computers	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
		جيولوجي Geophysics	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
		حقوق الانسان Human Rights	أساسي	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية(١) Practical Physics I Mechanics, 2 ٢) Electricity Computers, ٢) 2Geophysics	PPP 121	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	كيمياء تحليليه Analytical Chemistry		
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	مغناطيسيه Magnetism	PMg 104	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك (٢) Mechanics II	PMe 106	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	رياضيات (٢) Mathematics II	PMa 108	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	البصريات(٢) optics II	PO 102	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	علم الفلك Astronomy		
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية II Practical Physics II (Mechanics 2 Magnetism 2)	PPP 122	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	اللغة العربية Arabic Language		
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	حرية وديمقراطية Freedom and		

																	Democracy		
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الكترونيات التماثلية Analog Electronocs	PAE 209	المرحلة الثانية
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك تحليلي (١) Analytical Mechanics I	PAM 205	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	رياضيات (٣) Mathematics III	PMa 207	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء الحديث (١) modern Physics I	PMP 203	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ثرموداينمك (١) Thermodynamics I	PTh 201	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	Numerical Analysis	PNA 211	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الكيمياء الفيزياوية I Physical Chemistry I	PPC 213	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية I Practical Physics I (Thermodynamics ٢، Modern Physics ٢، Analog ٢ Electronics)	PPP 221	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك تحليلي (٢) Analytical Mechanics II	PAM 206	

	PDE 210	الكترونيات رقميه Digital Ekectronics	أساسي	+	+														+
	PMa 208	رياضيات (٤) Mathematics IV	أساسي	+	+														+
	PTH 202	الثرموداينمك (2) Thermodynamics II	أساسي	+	+														+
	PMP 204	الفيزياء الحديثه (٢) Modern Physics II	أساسي	+	+														+
	PPC 214	الكيمياء الفيزياوية (٢) Physical Chemistry II	أساسي	+	+														+
	PPP 222	IIالفيزياء العملية Practical Physics II ٢)Thermodynamics ، ٢ Modern Physics، ٢ Digital Electronics(	أساسي	+	+														+
المرحلة الثالثة	PMa 309	رياضيات (5) Mathematics V	أساسي	+	+														+
	PMP 311	فيزياء حديثه (٣) Modern Physics III	أساسي	+	+														+

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	بصريات (3) Optics III	PO 301	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الميكانيك الكمي (١) Quantum Mechanics I	PQM 303	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء الليزر Laser Physics	PLP 305	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	موضوع خاص I Elective subjects I	PES 313	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك احصائي (١) Statistical Mechanics I	PSM 307	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية I Practical Physics I (Optics III ٢، Laser Physics ٢ (Micro LabI ٢	PPP 321	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	رياضيات (6) Mathematics VI	PMa 310	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	بصريات (٤) Optics IV	PO 302	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك كمي (٢) Quantum Mechanics II	PQM 304	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك احصائي (٢) Statistical Mechanics II	PSM 308	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الليزر في الطب Laser in medicine	PLP 306	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء الجزيئية Molecular Physics	PMoP 312	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	موضوع خاص II Elective subjects II	PES 314	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية II Practical Physics II (Optics IV ٢، Micro LabII ٢)	PPP 322	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء الرياضية mathematical physics	PMaP 409	المرحلة الرابعة
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء نوويه (١) Nuclear Physics I	PNP 401	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك كمي (٣) quantum mechanics III	PQM 407	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	النظرية الكهرومغناطيسية I Electromagnetic Theory I	PET 405	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	موضوع خاص (3) Elective Subjects III	PES 411	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	مشروع البحث I Research Project I	PRP 413	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء الحالة الصلبة I Solid State Physics I	PSS 403	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية I Research Project I Practical Physics I (Nuclear Physics ٢، Solid State ٢ Physics (Micro Lab III ٢	PPP 421	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء نوويه (٢) Nuclear Physics II	PNP 402	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء بلازما Plasma Physics	PPaP 410	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	ميكانيك كمي (٤) quantum mechanics IV	PQM 408	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	فيزياء الحالة الصلبة II Solid State Physics II	PSS 404	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	مشروع البحث (٢) Research Project II	PRP 414	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	موضوع خاص (4) Elective Subjects IV	PES 412	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	النظرية الكهرومغناطيسية II Electromagnetic Theory II	PET 406	

+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	أساسي	الفيزياء العملية (2) Practical Physics II (Nuclear Physics، Solid State Physics، Micro Lab IV)	PPP 422	

نموذج وصف المقرر

مراجعة أداء مؤسسات التعليم العالي ((مراجعة البرنامج الاكاديمي))

وصف المقرر

1-المؤسسة التعليمية	University of misan College of Science
2-القسم العلمي / المركز	Department of Physics
3-اسم / رمز المقرر	Optics I
4-الفصل الدراسي	First
5-بنية المقرر	

University of misan Subject: Optics I
College of Science Semester: First
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1- Nature and propagation of light
1-1 Introduction.
1-2 Properties of light.
1-3 Refractive index.
1-4 Optical path.
1-5 Speed of light.
1-6 Shadows.
1-7 The wavelength of light.
1-8 Electromagnetic spectrum.
1-9 Visible region.
1-10 Dual nature of light.
1-11Fermat principle
2- Reflection and refraction at plane surfaces
2-1 Light rays
2-2 Reflection and refraction at plane surface

2-3 Critical angles and total internal reflection
2-4 Refraction by plane parallel plates
2-5 Refraction by prism
2-6 Minimum deviation angle
2-7 Dispersion
2-8 Rainbow.

3- Reflection and refraction at spherical surfaces
3-1 Sign convention
3-2 Reflection and refraction at spherical surfaces
3-3 Mirrors
3-4 Lateral and longitudinal magnification
3-5 Focal points and focal lengths
3-6 Virtual images
3-7 Derivation of Gaussian formula .

4- Lenses
4.1 Lenses terminology
4.2 Thin lenses
4.3 Focal points and focal lengths
4.4 Conjugate points
4.5 Image tracing
4.6 Lens maker's equation
4.7 Gaussian formula of thin lenses
4.8 Magnification
4.9 Power of the lens
4.10 Compound lenses and equivalent focal length
4.11 Thick lens optics.

References:

Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008.
F.Sears, Addison-Wesley publishing company , Optics 1964.
F.Jenkins& H.White, Fudamentals of Optics by , McGraw Hill book company,4th edition ,1985.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Arabic	اسم / رمز المقرر
First	الفصل الدراسي
6-بنية المقرر	

University of misan
College of Science
Department of Physics

Subject: Arabic
Semester: First
Year: First Year Physics

Syllabus (Theory: 2 hours)

1- اللغة العربية وعلومها
2- اقسام الكلام
3- الاسم وعلاماته
4- الفعل وعلاماته
5- الحرف وعلاماته
6- فتح همزة (أن) وكسرها
7- المواضع التي يجب فيها فنح همزة (أن)
8- المواضع التي يجب فيها كسر همزة (أن)
9- المواضع التي يجوز فيها الامران
10- المعرب والمبني
11- المعرب والمبني من الاسماء
12- المعرب والمبني من الافعال
13- كتابة الهمزة مواضع كتابة همزة الوصل

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Electricity
الفصل الدراسي	First
7-بنية المقرر	

University of misan
College of Science
Department of Physics

Subject: Electricity
Semester: First
Year: First year physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour)

1-Charge and the Electric field
1-1 Electric charge
1-2 Coulomb law
1-3 Charge is conserved
1-4 Electric field
1-5 A point charge in an electric field
1-6 A dipole in an electric field.

2-Gauss's law
2-1 Flux of the electric field
2-2 Gauss's law

2-3 Gauss's law and Coulomb law
2-4 An insulated conductor

3-Electric Potential
3-1 Electric potential
Potential and the electric field 3-2
3-3 A group of point charges
3-4 potential due to a dipole
3-5 Electric potential energy
3-6 An insulated conductor.

4-Capacitors and dielectrics
4-1 Capacitance
4-2 Calculating Capacitance
4-3 Energy storage in an electric field
4-4 parallel plate capacitor with dielectric
4-5 dielectrics and atomic view.

5-Current and Resistance
5-1 Current and current density
Ohm's law-A microscopic view 5-2
5-3 Electromotive force
5-4 calculating the current
5-5 potential difference
5-6 Multi loop circuits
5-7 RC-circuits

Reference : Halliday ,Resnick and Walker, Fundamentals of physics 8th Edition ,John Wiley and Sons,Inc. (2008).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
English Language	اسم / رمز المقرر
First	الفصل الدراسي
8-بنية المقرر	

University of misan Subject: English Language
College of Science Semester: First
Department of Physics Year: First Year Physics

Syllabus (Theory: 1 hour, 1 unit)

1- Geometry
2- Measurement

3- The scope of Physical Science
4- Inside the Atom
5- Energy
6- Force and Motion
7- Heat and its Effects
8- Measuring Temperature
9- Electricity

References:

1- English as a Foreign Language for Science Students (Volume 1)
H.F. Brookes and H.Ross
2- English Studies Series 3 Physics, Mathematics, Biology and Applied Science
William F. Hawkins, Ronald Mackin
3- Reader's Digest Library Of Modern Knowledge (Volume 1) The World of Nature
4- Internet

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Geology	اسم / رمز المقرر
First	الفصل الدراسي
9-بنية المقرر	

University of misan Subject: Geology
College of Science Semester: First
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, 2 units)

1-Introducing Geology and an overview to important concept
1.1 Atoms, Elements and Minerals

2- Rocks
2.1 Igneous Rocks
2.2 Sedimentary Rocks
2.3 Metamorphic Rocks

3-Geologic structures
3.1 Folds
3.2 Fracture in Rocks, Joints and Fault
.

4- Earth quake
4.1 Earth interior and Geophysical properties

5-Geophysics
5.1 The place of Geophysics in Geology

6-Geophysical methods
6.1 Gravity method, principles and applications
6.2 Magnetic method, principles and applications
6.3 Electrical methods
a- Self-potential method
b- Resistivity method
6.4 Seismic methods
a- Refraction method
b- Reflection method
6.5- Geothermal method
6.6- Radioactive method

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematics I	اسم / رمز المقرر
First	الفصل الدراسي
10-بنية المقرر	

University of misan Subject: Mathematics I
College of Science Semester: First
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1-The Rate of Change of Function
1-1 Coordinates
1-2 Increments
1-3 Slope of the straight line
1-4 Equation of a straight line
1-5 Functions and graphs
1-6 Ways of combining functions
1-7 Behavior of functions
1-8 Slope of the curve
1-9 Derivative of a function
1-10 Velocity and Rate.

2- Limits

2-1 Definition of the limit of a function
2-2 Theorems about the limits
2-3 More theorems about limits
2-4 Limit applied to areas.
2-5 The continuity of function
2-6 Infinity functions

3-Derivatives of algebraic functions

3-1- Polynomial functions and their derivatives
3-2- Rational functions and their derivatives
3-3- Inverse functions and their derivatives
3-4- The increment of function
3-5- Composite functions
3-6- Derivatives of composite functions :the chain rule
3-7- The differentials dx and *dy.*
3-8- Formulas for differentiation repeated in the notation of differentials

4-Applications

4-1- Increasing or decreasing functions :the sign of *(dy/dx)*
4-2- Related rates
4-3- Significance of the sign of the second derivatives
4-4- Curve plotting
4-5- Maxima and minima :Theory
4-6- Maxima and minima :problems
4-7- Rolle's theorem

Reference: Calculus and Analytic Geometry, Thomas

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mechanics I	اسم / رمز المقرر
First	الفصل الدراسي
11-بنية المقرر	

University of Misan Subject: Mechanics I
College of Science Semester: First

Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours)

1- Review and Terminology
- 1-1 Position and displacement
- 1-2 Average velocity and average speed
- 1-3 Instantaneous velocity and speed
- 1-4 Acceleration

2- Vectors
- 2-1 Vectors and Scalars
- 2-2 Adding Vectors Geometrically
- 2-3 Components of vectors
- 2-4 Unit Vectors
- 2-5 Adding vectors by components
- 2-6 Vectors and the law of physics
- 2-7 Multiplying vectors

3- Motion in Two and Tree dimensions
- 3-1 Position and displacement
- 3-2 Average velocity
- 3-3 Average acceleration and instantaneous acceleration
- 3-4 Projectile motion
- 3-5 Uniform circular motion
- 3-6 Relative motion in one-dimension
- 3-7 Relative motion in two-dimension

4- Force and motion
- 4-1 Newtonian Mechanics
- 4-2 Newton's First law
- 4-3 Force
- 4-4 Mass
- 4-5 Newton's second law
- 4-6 Newton's third law
- 4-7 Friction
- 4-8 The Drag force and terminal speed
- 4-9 Uniform circular motion

References:

Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز

اسم / رمز المقرر	Computers
الفصل الدراسي	First
12-بنية المقرر	

University of misan Subject: Computers
College of Science Semester: First
Department of Physics Year: First Year Physics

Syllabus (Theory: 1 hour, 1 unit)

1-Matlab
2- Starting U
- 2-1 Windows Systems
- 2-2 Unix Systems
- 2-3 Command Lien Help
- 2-4 Demos

3- Matlab as a Calculator
4- Numbers & Formats
5- Variables
- 5-1 Variable Names

6- Suppressing output
7- Built – In Functions
- 7-1 Trigonometric Functions
- 7-2 Other Elementary Functions

8- Vectors
- 8-1 The Colon Notation
- 8-2 Extracting Bits of a Vector
- 8-3 Column Vectors
- 8-4 Transposing

9- Keeping a record
10- Plotting Elementary Functions
- 10-1 Plotting – Titles & Labels
- 10-2 Grids
- 10-3 Line Styles & Colours
- 10-4 Multi – Plots
- 10-5 Hold
- 10-6 Hard Copy
- 10-7 Subplot
- 10-8 Zooming
- 10-9 Formatted text on Plots
- 10-10 Controlling Axes

11- Keyboard Accelerators
12- Copying to and from Word and other applications
- 12-1 Window Systems
- 12-2 Unix Systems

13- Script Files

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Optics II	اسم / رمز المقرر
Second	الفصل الدراسي
13-بنية المقرر	

University of misan Subject: Optics II
College of Science Semester: Second
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour. 2 units)

1- Lens aberrations
- 1.1 First order theory
- 1.2 Third order aberration
- 1.3 Chromatic aberration
- 1.4 Achromatic lenses
- 1.5 Spherical aberration
- 1.6 Astigmatism
- 1.7 Distortion
- 1.8 Coma
- 1.9 Curvature of the field

2- Optical instruments
- 2.1 The eye
- 2.26 Defect of vision
- 2.3 Spectacles
- 2.4 Camera
- 2.5 Simple microscope
- 2.6 Eyepieces
- 2.7 Compound microscopes
- 2.8 Telescopes
- 2.9 Spectrometer
- 2.10 Refractometer
- 2.11 Prism binoculars
- 2.12 Rangefinder.

3-Interference
- 3.1 Introduction
- 3.2 Superposition of waves
- 3.3 Coherent sources
- 3.4 Double slit interference
- 3.5 Michelson interferometer

.

4- Diffraction

4.1 Introduction
4.2 Fraunhoffer and Fresnel diffraction
4.3 Diffraction by a single slit
4.4 Diffraction by a circular aperture.

5-Resolving power
5.1 Resolving power
5.2 Rayleigh's limit of resolution
5.3 Limit of resolution of the eye
5.4 Limit of resolution of a lens
5.5 Resolving power of an optical instruments.

References:

Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008.
F.Sears, Addison-Wesley publishing company , Optics 1964.
F.Jenkins& H.White, Fudamentals of Optics by , McGraw Hill book company,4th edition ,1985.
N.Subrahmanyam & Brij Lal, A Textbook of Optics S.Chad& company Ltd., 2009.

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Analytical Chemistry
الفصل الدراسي	Second
14-بنية المقرر	

University of misan Subject: Analytical Chemistry
College of Science Semester: Second
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, Practical: 3 hours, 2 units)

Theory

1- calculations used in analytical chemistry
2- principle of titration

2-1standard solution,

2-2 type of reaction in titremetric method,

2-3 acid base titration,

2-4 precipitation titration,

2-5 complex formation,

2-6 oxidation-reduction titrations.

3- Calculations by using the molar concentration in titrations. (mole, millimole, Molarity)

4- Calculations by using the Normality & Normal concentration. (eq.wt, millieq., Normality).

5- Titration curves in acid – base titration & the effect of concentration. (Strong acid-strong base) (Strong acid – weak base) (Weak acid-strong base).

6- The pH value and Buffer solution; (calculations the pH of NaHA solution).

7- Indicators uses in the volumetric titration.

8- Some uses in volumetric titration the composition of solutions during acid-base titration. Mixtures of (strong acids-weak acids), (poly function of bases).

9- Precipitation titration in titremetric.

10- Compleximetric titrations.

11- Oxidation – reduction titration (fundamental of electro chemistry & Nernest equation).

12- Standard electrodes potentials and cell potentials.

13- Equilibrium constants for oxidation – Reductions titrations.

Reference:

Practical

1- Identification of group I ions.

2-Separation a mixture of group I ions.

3- Identification of group IIA ions.

4- Separation of a mixture of group IIA ions.

5- Separation of a mixture of group I & IIA ions.

6- Prepcaration of a proximately 0.1 N of HCl solution & standard solution of 0.1N Na_2CO_3.

7- Standardization for prepared HCl solution by using methyl red & phenolphthaline indicators.

8- Determination the concentration of unknown Na_2CO_3 solution.

9- Determination the concentrations of mixed bases. (Na_2CO_3 & $NaHCO_3$) In ppm .

10- Determination the concentration of mixed bases (Na_2CO_3 & NaOH) In ppm.

11- Titrations of unknown basic solution.

12- Precipitation titration by using (Mohr's Method to determine Cl^-).

13- Oxidation reduction titration (preparation 0.1N of $KMnO_4$ solution then standardized with 0.1N of standard solution of oxalic acid).

14- Determination the conc. Of Fe^{++} by using standard solution of 0.1N $KMnO_4$

15- Compleximetric titration (determination Ca^{++} & Mg^{++} in water by E.D.T.A).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
English Language II	اسم / رمز المقرر
Second	الفصل الدراسي
15-بنية المقرر	

University of misan Subject: English Language II
College of Science Semester: Second
Department of Physics Year: First Year Physics

Syllabus (Theory: 1 hour, 1 unit)

1- Radiation
2- Nuclear Physics
3- Wave Motion
4- Optics
5- Laser
6-Nanotechnology
7- Plasma Physics
8- Black Holes
9- Atmosphere
10- Pollution
11- Global Warming
12-Ozone

References:

1- English as a Foreign Language for Science Students (Volume 1)
H.F. Brookes and H.Ross

2- English Studies Series 3 Physics, Mathematics, Biology and Applied Science William F. Hawkins, Ronald Mackin
5- Reader's Digest Library Of Modern Knowledge (Volume 1) The World of Nature
6- Internet

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Magnetism	اسم / رمز المقرر
Second	الفصل الدراسي
16- بنية المقرر	

University of Misan Subject: Magnetism
College of Science Semester: second
Department of Physics Year: First year physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1- The magnetic field
1-1 The definition of B
1-2 Magnetic force and current
1-3 Torque on a current loop
1-4 The Hall effect
1-5 Circulating charge
1-6 Cyclotron and synchrotrons.

2-Amperes' law
2-1 Lines of B
2-2 Two parallel conductor
2-3 B of a Solenoid
2-4 The Biot-Savart law

3-Faraday's law of induction
3-1 Faraday's experiments
3-2 Faraday's law of induction
3-3 Lenz's law

3-4 Time varying magnetic fields
3-5 Inductance and relative motion

4- Inductance
4-1 Inductance
4-2 Calculation of inductance
4-3 Energy and the magnetic field
4-4 Energy density and the magnetic field
4-5 Mutual inductances.

Reference: Halliday ,Resnick and Walker, Fundamentals of physics 8th Edition ,John Wiley and Sons,Inc. (2008).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematics II	اسم / رمز المقرر
Second	الفصل الدراسي
17- بنية المقرر	

University of misan Subject: Mathematics II
College of Science Semester: Second
Department of Physics Year: First Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1- Integration
1-1 The indefinite integral
1-2 Applications of indefinite integral
1-3 Differentiation and integration of sirens and cosines
1-4 Areas under a curve
1-5 Computation of areas as limits
1-6 Area by calculus
1-7 The definite integral and the fundamental theorem of integral calculus

2-Applications and definite integral
2-1 Area between two curves
2-2 distance
2-3 Volumes
2-4 Work

3-Transcendental functions
3-1 The trigonometric functions
3-2 The inverse trigonometric functions
3-3 Derivative of inverse trigonometric functions
3-4 The natural logarithmic

3-5 The derivative of *(ln x)*
3-6 Properties of natural logarithm
3-7 Graph of ($y=lnx$)
3-8 The exponential function
) $\log_a u$) and (a^u (3-9 The functions
3-10-Differential equations

4-Hyparbolic functions
4-1-Difinitions
4-2-Derivative and integral
4-3-The inverse hyperbolic functions

5-Methodes of integration
5-1 Basic formula
5-2 Powers of trigonometric functions
5-3 Even power of sines and cosines
5-4-Integrals with terms
$a^2-u^2, a^2+u^2\sqrt{u^2-a^2},\ \sqrt{a^2+u^2},\ \sqrt{a^2-u^2},$
5-5 Integral with ax^2+bx+c
5-6-Integration by partial method
5-7-Integration by parts
5-8-Integration of rational functions of sines and cosines
6-Plane analytic geometry
6-1- Curve and equations
6-2-Tangents and normal
6-3-Distance between two points
6-4-The circle
6-5-The parabola
6-6-The ellipse
6-7-The hyperbola

Reference: Calculus and Analytic Geometry, Thomas

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mechanics II	اسم / رمز المقرر
Second	الفصل الدراسي

17- بنية المقرر

University of Misan — Subject: Mechanics II
College of Science — Semester: Second
Department of Physics — Year: First Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1- Energy and Work
- 1-5 Work and Kinetic energy
- 1-6 Work done by the gravitational force
- 1-7 Work done by a general variable force
- 1-8 Work and potential enetgy
- 1-9 Path independent of conservative force
- 1-10 Conservation of Mechanical energy
- 1-11 Work done on a system by an external force
- 1-12 Conservation of energy

2- Center of mass and linear momentum
- 2-1 The center of mass
- 2-2 Newton's second law for a system of particles
- 2-3 Linear momentum
- 2-4 Collision and impulse
- 2-5 Conservation of linear momentum
- 2-6 Systems with varying mass: A rocket

3- Rotation
- 3-1 The rotation variable
- 3-2 Angular momentum
- 3-3 Rotation with constant angular acceleration
- 3-4 Kinetic energy of rotation
- 3-5 Torque
- 3-6 Newton's second law for rotation
- 3-7 Work and rotational kinetic energy

4- Rolling, Torque and angular momentum
- 4-1 Rolling as translation and rotation combined
- 4-2 The kinetic energy of rolling
- 4-3 The force of rolling
- 4-4 The angular momentum of a rigid body rotating about a fixed axis
- 4-5 Conservation of angular momentum

5- Oscillation
- 5-1 The simple harmonic oscillation
- 5-2 Simple harmonic motion
- 5-3 Energy consideration in simple harmonic motion
- 5-4 Application of simple harmonic motion
- 5-5 Relation between simple harmonic motion and uniform circular Motion

References:

Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008.

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Thermodynamics I
الفصل الدراسي	First
18- بنية المقرر	

University of Misan Subject: Thermodynamics I
College of Science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, recitation: 1 hour, 2 units)

1 Basic concepts and definitions
- 1.1 The nature of thermodynamics
- 1.2 Thermodynamics system, surrounding, boundaries
- 1.3 Pressure and the continuum
- 1.4 The equation of state of ideal gas
- 1.5 Temperature and zeroth law
- 1.6 Thermometers
- 1.7 Temperature scales
- 1.8 Thermal expansion of solid and liquid

2. Heat and work
- 2.1 Heat and internal energy
- 2.2 Specific heat , heat capacity and calorimetric
- 2.3 Change of phase (latent heat)
- 2.4 Heat transfer
- 2.5 Work
- 2.6 Microscopic and microscopic thermodynamics

3. First law of thermodynamics

4 second law of thermodynamics and its applications
- 4.1 Reversible and irreversible process
- 4.2 Heat engine
- 4.3 Gasoline engine Car not cycle
- 4.4 Otto engine

5. Entropy
- 5.1 entropy of surrounding
- 5.2 Gabs function
- 5.3 Helmholtz function
- 5.4 Enthalpy

6 Equations of state and general thermodynamics relation

7. Maxwell equations
   7.1 equations of TdS
   7.2 equations of energy
   7.3 equations of specific heat

Refrence :

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
electronic I	اسم / رمز المقرر
First	الفصل الدراسي
19- بنية المقرر	

University of Misan Subject: electronic I
College of Science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, 2 units)

1. Diodes and Applications
   1-1 Introduction to semiconductors- intrinsic and extrinsic (p-type, n- type).
   1-2 Diode (pn-junction): construction, biasing (forward and reverse biasing), IV-characteristic curve.
   1-3 Application of diodes: rectification (half wave and full wave rectification),Voltage doubler, clipper and clamper, logic gates.
   1-4 Power supply.
   1-5 Other types of diodes: Zener diode, LED, Photo diode…etc.

2 .Amplification
2-1 Definition of amplification.
2-2 Elements of amplification:
 1: Transistor: construction and circuits
-Common emitter circuit:
   -Characteristic curves, hybrid parameters, load line analysis, biasing
   -Circuits and thermal stability.
   -Voltage divider self-biased common emitter amplifier.
   - Common collector circuit.
   - Common base circuit.
   - The transistor as a switch.
2: Field effect transistor:
   a- Junction field effect transistor(JFET):
   -Construction and biasing
   -Common source circuit(self-biased)-Characteristic curves-

self bias line-optimum Q point.
- Common source circuit (voltage divider self-biased circuit).
- JFET amplifiers-calculation of gain.
- The JFET analog switch.
- The JFET as a variable switch.

b- Metaloxide semiconductor FET(MOSFET)
1- Depletion type (D-MOSFET).
-Construction.
-Modes of operation.
- Characteristic curves-biasing-applications
2- Enhancement type (E-MOSFET).
-Construction and creating the inversion layer.
-Characteristic curves.
-Biasing circuits.
-Applications.

3. Amplifiers
3-1 Properties of an ideal voltage amplifier.
3-2 Frequency response curve of amplifiers.
3-3 Multistage amplifiers:
-Determination of gain and frequency response.
-coupling of stages.
3-4 Classes of amplifiers (class A, class B ,class AB ,class C).
3-5 Calculations of power efficiency.
3-6 Class B push-pull amplifier.
3-7 Tuned amplifier.
3-8 Concept of feedback(positive and negative).
Configurations of negative feedback and the effect of each on the amplifier characteristics.

References:

1- Diefenderfer A.J.; Priniples of electronic instrumentation; Holt-Saunders International Editions.
2-MalvinoA.P.; Semiconductor circuit approximations (An introduction to transistors and integrated circuits);Fourth Edition(1985); McGraw-Hill book company.
3-Gupta B.R. ; Electronics and Instrumentation ; Third edition(2009); S.Chand &Company LTD.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز

Analytical mechanics I	اسم / رمز المقرر
First	الفصل الدراسي
20- بنية المقرر	

University of Misan Subject : Analytical mechanics I
College of science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (theory: 2, Tutorial 1, 2 units)

1- VECTOR CALCULUS AND KINEMATICS OF A PARTICLE
1-1Derivative of a vector
1-2 Position vector of a Particle, Velocity Vector, Acceleration Vector.
1-3 Vector Integration, Relative Velocity.
1-4 Derivatives of Products of Vectors, Tangential and Normal Components of Acceleration.
1-5 Velocity and Acceleration in Plane polar coordinates
1-6 Velocity and Acceleration in Cylindrical and Spherical Coordinates.

2- DYNAMICS OF A PARTICLE RECTILINER MOTION
2-1 Newton's laws of motion, Newton's First Law. Inertial Reference Systems
2-2 Mass and Force. Newton's Second and Third Laws
2-3 Linear Momentum, Motion of a Particle, Rectilinear Motion.
2-4 The Force as a Function of Position Only. The concepts of Kinetic and Potential Energy.
2-5 The Force as a Function of Velocity Only, The Force as a Function Time Only.
2-6 Vertical Motion in a resisting Medium Terminal Velocity.
2-7 Variation of Gravity with Height Energy Considerations in Harmonic Motion
2-8 Forced Harmonic Motion . Resonance, Motion Under a Non-sinusoidal Periodic Driving Force

3- DYNAMICS OF A PARTICALE GENERAL MOTION
3-1 The Work Principle, Conservation Force and Force Fields, Potential Energy Function.
3-2 Condition for the Existence of a Potential Function. The Del Operator.
3-3 Forces of The Separable Type, Motion of a projectile in a Uniform Gravitation Field.
3-4 The Harmonic Oscillator in Two and Three Dimensions
3-5 Motion of Charged Particles in Electric and Magnetic Fields.
3-6 Constrained Motion of a Particle, The Energy Equation for Smooth Constraints.
3-7 More Accurate Solution of the Simple Pendulum Problem and the Nonlinear Oscillator
3-8 Exact Solution of the Simple Pendulum by Means of Elliptic Integrals.
3-9 The Isochronous Problem, The Spherical Pendulum.

4- MOVING REFERENCE SYSTEM
4-1 Translation of the Coordinate System, Inertial Forces, General Motion of the Coordinates
System.

4-2 Dynamics of a Particle in a Rotating Coordinate System.
4-3 Effects of the Earth's Rotation,Foucault Pendulum.

5- CENTRAL FORCEES AND CELESTIAL MECHANICS
5-1 The Law of Gravity, Gravitational Force between a Uniform Sphere and a Particle.
5-2 Potential Energy in a Gravitational Field. Gravitational Potential
5-3 Potential Energy in a general Central Field, Angular Momentum.
5-4 The Law of Areas. Kepler's Laws of Planetary Motion, Orbit of a particle in a Central – force Field.
5-5 Energy Equation of the Orbit,Orbits in an Inverse – square Field.
5-6 Orbital Energies in the Inverse – square Field, Periodic Time of Orbital Motion.
5-7 Motion in an Inverse – square Repulsive Field . Scattering of Atomic Particle.
5-8 Motion in a Nearly Circular Orbit. Stability, Apsides & Apsidal Angles for Nearly Circular Orbits .
6- DYNAMICS OF A SYSTEM OF PARTICLES
6-1 Center of Mass and linear Momentum, Angular Momentum of a System.
6-2 Kinetic Energy of a System of a Particles, Motion of Two Interacting Bodies. The Reduced Mass.
6-3 Collisions,Oblique Collisions and Scattering . Comparison of Laboratory and C-M Coordinates.
6-4 Impulse, Motion of Body with Variable Mass. Rocket Motion.

Reference:-
Analytical Mechanics / by Grant R. Fowles.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematics III	اسم / رمز المقرر
First	الفصل الدراسي
21- بنية المقرر	

University of Misan Subject: Mathematics III
College of Science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, recitation: 1 hour, 2 units)

1. The logarithm, exponential, inverse, trig metric and hyperbolic functions (Transcendental Functions)
   1.1 With derivative
   1.2 With integration

2. Techniques and applications of integrations
   2.1 Integrations by parts
   2.2 Integration of rational functions by partial functions
   2.3 Trigonometric integrals
   2.4 Numerical integrations

3. Conic sections and polar coordinates
3.1 Conic sections and quadratic equations
3.2 Classifying conic sections by eccentricity
3.3 Quadratic equations and rotations
3.4 Polar coordinates
3.5 Areas and lengths in polar coordinates
3.6 Conic section in polar coordinates
3.7 Examples and applications
3.8 Homework + Tutorial+ Quiz

Reference: Thomas, Calculus and Analytic Geometry (Eleventh Edition-2008 Pearson Education)

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Modern Physics I	اسم / رمز المقرر
First	الفصل الدراسي
22- بنية المقرر	

University of Misan Subject: Modern Physics I
College of Science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1. Relativity
   1.1 The Principle of Relativity
   1.2 Inertial System of coordinates.
   1.3 Galilean transformation.
   1.4 Einstein's special theory of Relativity.
   1.5 Lorentz transformation.
   1.6 Inverse Lorentz transformation.
   1.7 Length contractions.
   1.8 Time dilation.

1.9 Transformation of Velocity.
1.10 Change of mass with Velocity.
1.11 Mass energy equivalence.
1.12 Example of Relativistic calculation.

2. Atomic view of electricity
2.1Electrical discharges.
2.2 Thomson's measurements of q/m.
2.3 Electron charge . {Millikan's oil drop experiment}.
2.4 Mass of the electron.
2,5 Mass spectroscopy.
2.6 Isotropic mass.

3. The Atomic view of radiation
3.1 Waves or particles.
3.2 Electricity and light.
3.3 Electrodynamics.
3.4 Thermal radiation.
3.5 Emission and absorption of radiation.
3.6 Black body radiation .
3.7 Wien and Rayleish-jeans law's.
3.8 Plank's law (emission quantized).
3.9 Stefan – Boltzman law and Wien displacement law.
3.10.Photoelectric effect.

Referrence
1. M. Russell Wehr & James A. Richards, The physics of the atom
2. Richard T. Wridner & Robert L.Sells, Elementry modern physics
3. M.C. Lovell & A.J. Avery. Physcal properties of material

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Numerical analysis	اسم / رمز المقرر
First	الفصل الدراسي
23- بنية المقرر	

University of Misan Subject: Numerical analysis
College of Science Semester: First
Department of Physics Year: Second Year Physics

Syllabus (Theory 3 hours, 3 units)

1. Introduction to numerical analysis
   1-1 Types of Errors
   1-2 Round off Errors
   1-3 Truncations Errors
   1-4 Initial Errors

2. Solution of non linear equations
   2-1 Bisection method 2-1
   2-2 False position method
   2-3 Iteration method
   2-4 Newton – Raphson method

3. Solution of Differential equations
   3-1 Explicit Euler's Differential equation
   3-2 Modified Euler's Differential equation
   3-3 Runge – Kutta method

4. Numerical Integration
   4-1 Rectangular method
   4-2 Trapezium method
   4-3 Simpson's method

المصادر:

Numerical analysisالتحليل العددي
تأليف: (د. أبو بكر احمد)
Numerical analysis Introduction toمبادئ التحليل العددي
تأليف: (د. علي محمد سيفي و د. ابتسام كمال الدين)

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Physical Chemistry I
الفصل الدراسي	First
24- بنية المقرر	

University of Misan — Subject: Physical Chemistry I
College of Science — Semester: First
Department of Physics — Year: Second Year Physics

Syllabus (Theory: 2 hours, 2 units)

1- Historical of Elements

1-1 Indroduction

1-2 Discovery of elements

1-3 Periodic table

1-4 Some physical properties of element

2- Atomic and Molecular Structure

2-1 The Electron

2-2 The atomic theories of Thomson and Rutherford

2-3 The wave nature of light

2-4 The Bohr atom

2-5 One electron spectra

2-6 Many electron atoms

2-7 Quantum number

3- Theory of chemical bonding

3-1 Electron spin

3-2 The Pauli exclusion principle

3-3 Electronic structure

3-4 Relation of electronic structure to the chemistry of the elements

3-5 The beginning of bonding theory

4- Type of chemical bond

4-1 Primary bondic

4-2 Ionic bond

4-3 Covalent bond

4-4 Metallic bond

4-5 Secondary bonding

4-6 Hydrogen bonding

5- The nature of the bonding in chemical compounds

5-1 Bonding in homonuclear diatomic molecules

5-2 Heteronuclear bond and the ionic character of bond

5-3 Electronegativities

5-4 Direct valence

5-5 Pi and sigma bond

6- Hybridization

6-1 Lewis structures

6-2 S,Pand d orbital

6-3 Octate rule

6-4 Break down of octate rule

6-5 Partial charge

6-6 Polarity of molecules

6-7 Molecular orbital energy level diagram for H2,He, and Li

6-8 Double bond, triple bond, para diamagnetism

6-9 The shape of molecules, electron domain

7- The colligative properties

7-1 Vapor pressure lowering

7-2 boiling point elevation

7-3 Freezing pointy depression

7-4 Osmotic pressure

7-5 Osmotic pressure determination of molecular weights

References:

1- Gordon Barrow, Physical chemistry,McGraw-Hill Book Compoany
2- MIT course for undergraduate 2004.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Physical Chemistry II	اسم / رمز المقرر
Second	الفصل الدراسي
25- بنية المقرر	

University of Misan Subject: Physical Chemistry II
College of Science Semester: Second
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, 2 units)

1.The matter
- 1.1 gas phase
- 1.2 liquid phase
- 1.3 Solid phase
- 1.4 Characterization of atomic structures

2. The structure of atoms and crystals
- 2.1 Metallic characteristics
- 2.2 Chemical behavior and the metallic bond
- 2.3 Arrangement of atoms in metals
- 2.4 Metals and insulators
- 2.5 Real crystals and imperfection

3. Ceramics and Alloys
- 3-1 Oxide
- 3-2 Nitride
- 3-3 Carbide
- 3-4 Some properties of ceramics
- 3-5 Simple alloys
- 3-6 Some methods of preparation

4- X-ray
- 4-1 X-ray generation
- 4-2 Moseley law and elements detection
- 4-3 Bragg law
- 4-4 Difractometer, Deby-Schereer,Laue method
- 4-5 Defect in crystals

4-6 Point, line, and interfacial defect
4-7 Amorphous
4-8 Glass formation and silicate

5- Phase diagram and diffusion
5-1 Water
5-2 two component
5-3 The study state.

References:

1- Van Vlack, Materials science for engineering, Addison-Wesley 1970
2- R.E. Smallman, Modern physical metallurgy, Butterworths, 1985.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Analytical mechanics II	اسم / رمز المقرر
Second	الفصل الدراسي
26- بنية المقرر	

University of Misan Subject : Analytical mechanics II
College of science Semester: Second
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1- MECHANICS OF RIGID BODIES. MOTION IN A PLAN

1-1Center of Mass of a Rigid Body, Static Equilibrium of a Rigid Body.
1-2Calculation of the Moment of Inertia, The Physical Pendulum.
1-3A general Theorem Concerning Angular Momentum , Laminar Motion of a rigid Body
1-4Body Rolling Down an Inclined Plane, Motion of a rigid Body Under an Impulsive Force
1-5 Collision of Rigid Bodies

2- GENERAL MOTION OF A RIGID BODY

2-1 Angular Momentum of a rigid Body . Products of Inertia , Principal Axes of a rigid Body.
2-2 Rotational Kinetic Energy, Moment of Inertia of a rigid Body about an Arbitrary Axis.
2-3 The Momental Ellipsoid,The Momental Ellipsoid, Euler's Equation of Motion of Rigid Body
2-4 Free Rotation of a Rigid Body Under no Forces . Geometric Description of the Motion
2-5 Free Rotation of a Rigid Body with an Axis of Symmetry. Analytical Treatment

2-6 Gyroscopic Precession . Motion of atop, Use of Matrices in Rigid Body. Dynamics. Inertia Tensor.

LAGRANGE'S EQUATIONS

3-1 Generalized Coordinates, Generalized Forces , Lagrange's Equations.
3-2 Some Application of Lagrange's Equations, Generalized Momenta . Ignorable Coordinates.
3-3 Lagrange's Equations for Impulsive Forces, Hamilton's Variational Principle.
3-4 The Hamiltonian Function. Hamilton's Equation, Lagrange's Equation of Motion with Constraints

THEORY OF VIBRATIONS

4-1 Potential Energy and Equilibrium . Expansion of the Potential – energy Function in a power Series.
4-2 Oscillation of a System with One Degree of Freedom, Two Coupled Harmonic Oscillators.
4-3 Normal Coordinates, General Theory of Vibrating Systems, Vibration of a loaded String
4-4 Vibration of a Continuous System. The Wave Equation , Sinusoidal Waves

THE SPECIAL THEORY RELATIVITY

5-1 The Michelson – Morley Experiment, Einstein's Postulates of Special Relativity
5-2 The Lorentz Transformation, Consequences of the Lorentz Transformation
5-3 Length Contraction and Time Dilation, Space – Time, Space Travel and Twin Paradox
5-4 Relativistic Particle Dynamics. The Variation of Mass with Velocity, The Mass – energy Relation
5-5 The Use of Matrices and Four – vectors in Relativity

Reference :-

Analytical Mechanics / by Grant R. Fowles.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Digital electronics	اسم / رمز المقرر
Second	الفصل الدراسي
27- بنية المقرر	

University of Misan Subject : Digital electronics
College of science Semester: Second
Department of Physics Year: Second Year Physics

1: Logic gates :
1-1 Decision making elements
NOT, OR, AND, NOR, NAND, XOR, XNOR –Gates

1-2 Combinational logic circuit
1-3 Simple logic circuits
1-4 Universality of the NAND-gate
1-5 Universality of the NOR-gate

2 : Numbering systems
2-1 Decimal numbers
2-2 Binary numbers
2-3 Binary addition,
2-4 Binary subtraction (1's and 2's complements methods)
2-5 Binary multiplication
2-6 Binary division
2-7 Octal numbering system
2-8 Hexadecimal numbering system
2-9 Conversion between the systems
2-10 Digital codes
1- Binary coded decimal code (BCD code)
2- Excess-3 code (Xs-3 code)
3- Gray code

3 : Boolean algebra
3-1 Laws of Boolean algebra
Commutative law
Associative law
Distributive law
3-2 Rules of Boolean algebra
3-3 De Morgan's theorems
3-4 Simplifying logic equations using Boolean algebra

4 :Arithmetic logic circuits
4-1 Addition (half adder-full adder – binary adder)
4-2 Subtraction (half subtractor –full subtractor- binary subtractor)
1's complement subtractor logic circuit
2's complement adder subtractor logic circuit
4-3 Logic families
Resistor- transistor logic (RTL)
Diode-transistor logic (DTL)
Transistor-transistor logic (TTL)
Emitter coupled logic (ECL)
Integrated-injection logic (I^2L)
Metal oxide semiconductor logic MOS

5: Logic gates: 2-memory elements (flip-flops)
5-1 Bistable multivibrator as a memory element
5-2 RS flip-flop
5-3 D flip-flop
5-4 JK flip-flop
5-5 T flip-flop
5-6 Master-Slave flip-flop
5-7 Use of flip-flops as a simple counter

6 : Simplifying logic equations
6-1 Fundamental products
6-2 Simplifying logic equations using Karnaugh maps
AND-OR network

OR-AND network
NAND-NAND networks
NOR-NOR networks

7 : Registers
- 7-1 Serial in- serial out shift register
- 7-2 Serial in- parallel out shift register
- 7-3 Parallel in- serial out shift register
- 7-4 Parallel in- parallel out shift register

8 : Counters
- 8-1 Types of counters
- 8-2 Serial (Asynchronous) counters
- 8-3 Ripple counter
- 8-4 Parallel (Synchronous) counters
  - Two stages synchronous counter
  - Three stages synchronous counter
- 8-5 Ring counters
- 8-6 Johnson counters
- 8-7 Modulus counters

9 : Decoders and Encoders

Reference:

1- Floyd T.L.: Digital Fundamentals ;1982 (second edition) ;
Merril Publishing Company.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematics IV	اسم / رمز المقرر
Second	الفصل الدراسي
28- بنية المقرر	

University of misan Subject: Mathematics IV
College of Science Semester: second
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1. Infinite sequences and series
   - 1.1 Infinite series
   - 1.2 Integral ,comparison , ratio and root tests
   - 1.3 Power series
   - 1.4 Taylor and Maclaurin Series
   - 1.5 Fourier series

2. Vectors and the geometry of the space
2.1 Three- dimensional space coordinates systems
2.2 Vectors
2.3 The dot and cross product
2.4 Lines and planes in space
2.5 Cylinders and quadratic surfaces
2.6 Applications and examples
2.7 Homework + Tutorial +Quiz

3. Partial derivatives
3.1 Functions of several variables
3.2 Limits and continuity
3.3 Partial derivatives
3.4 Chain rule
3.5 Directional derivatives and gradients vectors
3.6 Extreme values and saddle points
3.7 Lagrange multipliers
3.8 Taylor formula for two variables

References: Thomas, CALCULUS (Elventh Edition-2008 Pearson Education)

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Modern Physics II
الفصل الدراسي	Second
29- بنية المقرر	

University of Misan Subject: Modern Physics II
College of Science Semester: Second
Department of Physics Year: Second Year Physics

Syllabus (Theory: 2 hours, Tutorial: 1 hour, 2 units)

1. The Atomic models of Rutherford and Bohr
1.1 Introduction.
1.2 The Rutherford model of the atom.
1.3 Spectrum of hydrogen gas.
1.4 Boher model of theory of atoms.
1.5 Energy levels of hydrogen atom.
1.6 Binding energy.
1.7 Ionization Potentials of hydrogen atom.
1.8 Many electron atoms.

1.9 Quantum Numbers.
1.10 Pauli Exclusion principle.
1.11 Electron shells & chemical Activity.

2. Structure of solids.
2.1.Introduction.
2.2 Atomic bonding.
-Ionic bonding.
- Covalent bonding.
- Metallic bonding.
- Vander wall's bonding.
2.3 Unit cell.
2.4 Miller indices.
2.5 Crystal structure.
- Lattice planes and direction
- Atomic packing.

3. X-rays
3.1 Discovery.
3.2 Production of x-rays.
3.3 The Nature of x-rays.
3.4 X-rays diffraction.
3.5 Mechanism of x-ray production.
3.6 X-ray energy levels.
3.7 Xx-ray spectra of the elements Atomic number.
3.8 Compton scattering.

Referrence

1. M. Russell Wehr & James A. Richards, The physics of the atom
2. Richard T. Wridner & Robert L.Sells, Elementry modern physics
3. M.C. Lovell & A.J. Avery. Physcal properties of material

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Statistical Mechanics I	اسم / رمز المقرر
First	الفصل الدراسي
-30 بنية المقرر	

University of Misan Subject: Statistical Mechanics I
College of Science Semester: First
Department of Physics Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1- Introduction
- 1-1- The scope of statistical physics
- 1-2- Description of the assemblies
- 1-3- The average properties of an assembly
- 1-4- Classical and quantum assemblies

2- Maxwell-Boltzmann Statistics
- 2-1- Distribution over energies
- 2-2- Weight of configurations
- 2-3- The most probable configuration
- 2-4-The sharpness of the configuration maximum
- 2-5- Probability current density
- 2-6-The multiplier β
- 2-7- The Maxwell Boltzmann Distribution

3- Applications of Maxwell Boltzmann Statistics
- 3-1- Average properties of the system
- 3-2- The classical perfect gas
- 3-3- Mean and most probable velocities
- 3-4- The Doppler broadening of spectral lines
- 3-5- Equipartition of energy
- 3-6- the specific heats of gases
- 3-7- The Einstein Diffusion equation

4- Bose- Einstein Statistics
- 4-1- The Bose-Einstein Distribution
- 4-2- The Bose-Einstein gas
- 4-3- Black body radiation: the Photon gas
- 4-4- The specific heats of solid: the Phonon gas

5- Fermi-Dirac Statistics
- 5-1- The Fermi-Dirac Distribution
- 5-2- The Fermi-Dirac gas
- 5-3- Pauli paramagnetism
- 5-4- Thermoionic emission

References:

1- " An Introduction to Statistical Mechanics " , A.J. Pointen
2- "Statistical Mechanics ", 2nd. Edition ,Franz Schwabl, (2006)
3- "Statistical Mechanics made Simple", Daniel C. Mattis ,(2003)

(ملاحظة: المصادر 2و3 أقراص مدمجة متوفرة في قسم الفيزياء)

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics

اسم / رمز المقرر	laser
الفصل الدراسي	Second
31- بنية المقرر	

University of Misan Subject: laser
College of Science Semester: Second
Department of Physics Year: Third Year Physics

Syllabus (Theory 2 hours, 3 units)

chapter one -absorption

,spontaneous emission,stimulated emission,stimulated emission rate and absorption rate,transition cross – section gaine and absorption cofficents,einstin cofficents,line broadening mechanisms the saturation

Chapter twO 1-historical aspect,2- laser concept,3- population inversion and threshold,4-pumping processes

-5pumping power,6- pumping methods,6-1- optical pumping,6-2- electrical pumping,6-3-chemical pumping

Chapter three optical resonator

1- resonator design,2- generalized spherical resonator,3- resonator stability,4- resonator vibrational modes,5- resonator quality factor

-1-absorption,spontaneous emission,stimulated emission,stimulated emission rate and absorption rate,transition cross – section gaine and absorption cofficents,einstin cofficents,line broadening mechanisms the saturation

chapter three types of laser 1- solid state laser 2- gas laser 3- liquid laser 4- chemical laser 5 - semiconductor laser 6 - x-ray laser 7- random laser

chapter one laser results and modification 1-pulsed and cw laser 2-line selecation of laser emission spectrum 3- single mode operation 4- lamp dip and stabilization of laser frequency 5- mode loking 6- methods of mode loking 7- q-switcging 8- q-switching methods 9- energy and power of q-switching pulse
chapter two properties of laser beam 1- spectral purity 2-directionality 3-coherence 3-1-temporal coherence 3-2-spatial coherence 4-speckle pattern 5-brightness 6 - tuning 7- ultra short pulses
chapter four laser application

chapter five risk and safety conditions in laser laboratory

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Mathematics V
الفصل الدراسي	First
32- بنية المقرر	

University of Misan — Subject: Mathematics V
College of Science — Semester: First
Department of Physics — Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1. Vectors and Scalars
   - 1.1. Vectors
   - 1.2. Scalars
   - 1.3. Vector Algebra
   - 1.4. Laws of vector algebra
   - 1.5. Unit Vectors
   - 1.6. Rectangular unit vectors
   - 1.7. Components of a vector
   - 1.8. Scalar fields
   - 1.9. Vectors fields
   - 1.10. Examples, Exercises and Problems
2. The Dot and Cross Product
   - 2.1. Dot or scalar products
   - 2.2. Cross or vector products
   - 2.3. Scalar triple products
   - 2.4. vector triple products
   - 2.5. Reciprocal sets of vectors
   - 2.6. Examples, Exercises and Problems
3. Vector Differentiation
   - 3.1. Ordinary derivatives of vectors
   - 3.2. space curves
   - 3.3. Continuity and differentiability

3.4. Differentiation formulas
3.5. Partial derivatives of vectors
3.6. Differentials of Vectors
3.7. Differential geometry
3.8. Examples, Exercises and Problems

4. Gradient, Divergence and Curl
   4.1. The vector differential operator del
   4.2. The Gradient
   4.3. The Divergence
   4.4. The Curl
   4.5. formulas involving del
   4.6. Examples, Exercises and Problems
5. Vector Integration
   5.1. Ordinary integrals of vectors
   5.2. Line integrals
   5.3. Surface integrals
   5.4. Volume integrals
   5.5. Examples, Exercises and Problems

References:

1. Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
2. Modern Physics and Quantum Mechanics, E. E. Anderson
3. Introduction to quantum mechanics, Dick and Wittike
4. Introduction to quantum mechanics, D. Park

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Modern Physics III
الفصل الدراسي	First
33- بنية المقرر	

University of Misan — Subject: Modern Physics III
College of Science — Semester: First
Department of Physics — Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1-Waves and Particles

1-1- Wave-Particle duality of light.
1-2- The de-Broglie Hypotheses .
1-3- Bohr's first Postulate.
1-4- The Davison and Germer experiment.

1-5- Wave groups: Group velocity and Phase velocity.
1-6-Wave –Particle duaity.
1-7-The Hisenberg Uncertainty principle.
1-8- The Double slit experiment.

2- Natural Radioactivity

2-1- Discovery of Radioactivity
2-2- Detectors: (Gas-filled, Scintillation, Track, Semiconductor Detectors.)
2-3- Energies of the radiation
2-4- Law of radioactive Disintegration.
2-5- Radioactive Series.
2-6- Radiation Hazard.
2-7- The Radium Radiation in Medicine.

3-Nuclear Reactions .

3-1- The nuclear constituents
3-2- Forces between Nucleons.
3-3- Nuclear Radii.
3-4- Neutron Diffraction.
3-5- Accelerators.
3-6- Nuclear Mass-Energy equation: Q-Value.
3-7- Center of Mass Coordinate.
3-8- Artificial (Induced)Radioactivity.
3-9- Nuclear Binding Energy.
3-10- Mossbaur Effect.

References:

1-Physics of the Atom.(M.Russell Wehr, James,A.Richards, Jr. and Thomas.w.Adior.)
2-Elementary Modern Physics.(Richard T.Weidner and Robert L.Sells)

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Optics III	اسم / رمز المقرر
First	الفصل الدراسي
34- بنية المقرر	

University of Misan Subject: Optics III
College of Science Semester: First
Department of Physics Year: Third year Physics

Reference
Introduction to Modern optics, by Grant R. Fowlles
Fundamental of optics, by Jenkins and White
Optics, by Hect and Zajac
Optics, by Miles and Thomas

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Quantum Mechanics I
الفصل الدراسي	First
35- بنية المقرر	

University of Misan — Subject: Quantum Mechanics I
College of Science — Semester: First
Department of Physics — Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1- Review
- 1-1- The origin of quantum Mechanic
- 1-2- Shortcomings of the old quantum theory
- 1-3- The Uncertainty and Complementary principle
- 1-4- The wave-particle duality

2- Schrodinger Wave Equation
- 2-1- Derivation of Schrodinger equation
- 2-2- Interpretation of the wave function
- 2-3- Properties of the wave function
- 2-4- Probability
- 2-5- Normalization
- 2-6-Parity of the wave function
- 2-7- Probability current density

3- Time-independent Schrodinger equation
- 3-1- Stationary states
- 3-4- Operators
- 3-5- Linear momentum operator
- 3-6- The Hamiltonian operator
- 3-7- Commute operators
- 3-8- Simultaneous eigen functions

4- Eigen values and eigen functions
- 4-1- Degeneracy
- 4-2- Hermitian operators
- 4-3- The properties of a Hermitian operator
- 4-4- Expectation values-Variance
- 4-5-The correspondence principle and Ehrenfest theorem
- 4-6- Deviations
- 4-7- Dirac bracket notation

5- Solutions of some one-dimensional unbound systems
- 5-1- Step potential

5-2- The finite potential barrier
5-3- The square well potential
5-4- Infinite square well potential

6- Solutions of one and three-dimensional bound systems
6-1 - Particle in potential box of side a
6-2- Particle in potential box of side a, b, c
6-3- Density of energy levels

References:

5. Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
6. Modern Physics and Quantum Mechanics, E. E. Anderson
7. Introduction to quantum mechanics, Dick and Wittike
8. Introduction to quantum mechanics, D. Park
9.

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Statistical Mechanics II I
الفصل الدراسي	Second
36- بنية المقرر	

University of Misan — Subject: Statistical Mechanics II I
College of Science — Semester: Second
Department of Physics — Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1- Temperature and Entropy
1-1- The statistical concept of temperature
1-2- Entropy
1-3- The free energy

2- The Thermodynamics of Gases
2-1- The weight W_{max} for a classical perfect gas
2-2- The Boltzmann Partition Function
2-3- The evaluation of the Classical Partition Function
2-4-Gibb's paradox
2-5- The semi-classical perfect gas
2-6-Components of the Partition function

3- Applications of Statistical Thermodynamics
3-1- The paramagnetic gas
3-2- the harmonic oscillator
3-3- The diatomic molecule
3-4- The two energy level system

3-5- The disordered lattice

4- The Canonical Ensemble
4-1- Ensemble
4-2- The constant temperature ensemble
4-3- Thermodynamic properties of the canonical ensemble
4-4- The evaluation of the Total Partition Function
4-5- The energy distribution over the canonical ensemble
4-6- Application of the canonical ensemble to an imperfect gas
4-7- Fluctuation of the assembly energy in a canonical ensemble
4-8- The quantum mechanical density operator

5- The Grand Canonical Ensemble
5-1- Thermodynamic function of an open assembly
5-2- The Grand Partition Function
5-3- Evaluation of the Grand Partition Function
5-4- Fluctuation in the number of systems
5-5- The Chemical potential in the equilibrium state

References:

4- " An Introduction to Statistical Mechanics " , A.J. Pointen
5- "Statistical Mechanics ", 2nd. Edition ,Franz Schwabl, (2006)
6- "Statistical Mechanics made Simple", Daniel C. Mattis ,(2003)

(ملاحظة: المصادر 2و3 أقراص مدمجة متوفرة في قسم الفيزياء)

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematics VI	اسم / رمز المقرر
Second	الفصل الدراسي
37- بنية المقرر	

University of Misan — Subject: Mathematics VI
College of Science — Semester: second
Department of Physics — Year: Third year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1. The Divergence Theorem, Stokes' Theorem and Related Integral Theorems
   1.1. The divergence theorem of Gauss
   1.2. Stokes' theorem
   1.3. Green's theorem in plane
   1.4. Related integral theorems

1.5. Integral operator form for del
1.6. Examples, Exercises and Problems

2. Complex Variables
   2.1. Complex numbers
   2.2. Algebraic preliminaries (Addition, Subtraction, Multiplication and Division of complex numbers)
   2.3. The geometric representation of complex numbers
   2.4. Absolute values of complex numbers
   2.5. Demoivre's theorem
   2.6. Functions of a complex variable
   2.7. Analytic functions
   2.8. Cauchy-Riemann equations
   2.9. Elementary functions of z
   2.10. Differentiation of a complex variable
   2.11. Examples, Exercises and Problems

3. Group Theory
   3.1. Definition of a group
   3.2. Cyclic group
   3.3. Isomorphism
   3.4. Symmetry transformation of a square
   3.5. The multiplication table for the group C_{4v}
   3.6. Definition of a group

References for 1st and 2nd Semesters

1. H. S. Weber and G. B. Arfken, "Essential Mathematical Methods for Physicists", 6th Ed., Elsevier (2005).
2. C. Ray Wylie, "Advanced Engineering Mathematics", 4th Ed. (International Students Edition), Mcgraw-Hill (1975).
3. Sokolnikoff and Redheffer, "Mathematics of Physics and Modern Engineering" Mcgraw-Hill (1958).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Optics IV	اسم / رمز المقرر
Second	الفصل الدراسي
-38 بنية المقرر	

I	Michelson interferometer
1-1	Michelson interferometer
1-2	Circular and localized fringes
1-3	Applications of Michelson's interferometer
1-3-1	Measurement of wavelength
1-3-2	Measurement of wavelength difference
1-3-3	Measurement of refractive indices or thickness for plate
1-3-4	Measurement of length
1-3-5	Testing of the perfection of surfaces
1-4	Spectral resolution of finite wave train Coherence and linewidth
II	Interference involving multiple reflections
2-1	Introduction
2-2	Reflection from parallel films
2-2-1	Airy function
2-3	Fabry – Perot interferometer
2-3-1	Chromatic resolving power of Fabry – Perot instruments
2-4	Newton's rings
2-4-1	Using the experiment of Newton's rings to measure the refractive index
2-5	Theory of multilayer films
2-5-1	Antireflection films
2-5-2	High reflectance films
2-5-3	Fabry – Perot interferometer filter
2-6	Examples
III	Diffraction phenomena
3-1	General description of diffraction
3-2	Fundamental theory
3-3	The Fresnel – Kirchhoff formula
3-4	Fraunhofer and Fresnel diffraction
3-5	Fraunhoffer's diffraction patterns
3-5-1	The single slit
3-5-2	The rectangular aperture
3-5-3	The circular aperture
3-5-3-1	Optical resolution
3-5-4	The double slits
3-5-5	Multiple slits – Diffraction gratings
3-5-5-1	Resolving power of grating
3-6	Positions of the maxima and minima missing orders

3-7	Comparison of the single slit and double slits pattern
3-8	Fresnel's diffraction pattern
3-9	Fresnel's zones
3-10	Zone plate
3-11	Rectangular aperture
3-12	Examples
IV	Polarization of light
4-1	Natural light
4-2	The polarization of light
4-3	Methods of producing polarization
4-4	Types of polarization
4-4-1	Linear polarization
4-4-2	Circular polarization
4-4-3	Elliptical polarization
4-5	Matrix representation of polarization – The Jones calculus
4-5-1	Applications of Jones notation (matrix notation)
4-6	Orthogonal polarization
4-7	Polarization angle and Brewster law
4-8	Examples
	Reference
1-	Introduction to Modern optics, by Grant R. Fowlles
2-	Fundamental of optics, by Jenkins and White
3-	Optics, by Hect and Zajac
4-	Optics, by Miles and Thomas

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Quantum Mechanics II	اسم / رمز المقرر
Second	الفصل الدراسي
-39 بنية المقرر	

University of Misan — Subject: Quantum Mechanics II
College of Science — Semester: Second
Department of Physics — Year: Third Year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1- The Equation of Motion
   1-1- The equation of Motion and Poisson Brackets
   1-2- The correspondence principle and the Ehrenfest theorem

2- Solutions of One-dimensional Bound system
2-1- The Harmonic oscillator: Polynomial solution
2-2- Method of generating the Hermite polynomials
2-3- Energy levels
2-4- Zero-point energy
2-3- The probability density of the harmonic oscillator

3- Spherically Symmetric Potentials in Three Dimensions
3-1- Schrodinger equation in three coordinates
3-2- Separation of radial and angular variables
3-3- Legendre polynomials
3-4- Spherical harmonics
3-5- Parity
3-6- The Hydrogen atom
3-7- Laguerre polynomials
3-8- Hydrogen- atom wave functions
3-9- Energy levels
3-10- Degeneracy

4- Angular Momentum in Quantum Mechanics
4-1- Central force and orbital angular momentum
4-2- General definition of angular momentum
4-3- Operators and commutators
4-4- Eigen- functions and eigen-values
4-5- Spin
4-6- Spin eigenvectors
4-7- Spin-orbit interaction
4-8- Total angular momentum

References:

10. Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
11. Modern Physics and Quantum Mechanics, E. E. Anderson
12. Introduction to quantum mechanics, Dick and Wittike
13. Introduction to quantum mechanics, D. Park

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Solid State Physics I
الفصل الدراسي	First
40- بنية المقرر	

University of Misan Subject: Solid State Physics I
College of Science Semester: First

Syllabus (Theory: 2 hours, Tutorial 1 hour, 2 units)

1- Crystal structure-
1-1 Basis, Lattice crystal translation vector and lattice-symmetry operations
1-2 two dimensional lattice type-three dimensional lattice type
1-3 Miller indices, the indices of a direction, Position in the cell
1-4 simple crystal structure (Sodium chloride structure, Cesium chloride structure
1-5 Close-packed structure-Diamond structure, Zinc Sulfide structure).

2- Crystal diffraction and the reciprocal lattice
2-1 Bragg law-Experimental diffraction methods
2-2 Laue method-rotating crystal method-powder method
2-3 reciprocal lattice-Brilloun zones
2-4 structure factor of the basis.

3- Crystal Binding-crystal of Inert gases
3-1 Vander Waals
3-2 London interaction
3-3 equilibrium lattice constants
3-4 Cohesive energy
3-4 Repulsive interaction
3-5 Compressibility and Bulk modulus
3-6 Ionic crystal
3-7 Madelung energy
3-8 Covalent crystal
3-9 Metal crystal
3-10 Hydrogen
3-11-bonded crystal
3-12 Atomic radii,

4- Phonons and Lattice vibrations
4-1 phonon Momentum
4-2 Inelastic scattering of photons by long wavelength phonons
4-3 Inelastic scattering of neutrons by phonons
4-4 Vibration of monatomic lattices-group velocity
4-5 phase velocity
4-6 Vibrational modes of Lattice with two atoms per primitive cell-Local phonon modes.

5- Thermal properties of solids
5-1 Lattice heat capacity
5-2 Classical model for specific heat
5-3 Einstein model
5-4 Density of modes in one dimension
5-5 Density of modes in three dimensions
5-6 Debye model of the lattice heat capacity, Anharmonic crystal interactions
5-7 thermal expansion-thermal conductivity
5-8 Lattice thermal resistivity

5-9 Normal and Umklapp processes.

6- Free electron model
6-1 classical free electron theory
6-2 Drude model-Lorentz model
6.3Thermal conductivity for free electron gas,

7- Quantum free electron model

7-1 energy levels and density of state in one dimension-free electron gas in three dimensions

7-2 density of state for free electron gas in three dimensions

7-3 -Somerfield's model for metallic conduction

7-4 electrical conductivity,

References :

I. Introduction to solid state physics C.Kittel
II. Solid State Physics, J.S.Blakemore

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Electromagnetic Theory I	اسم / رمز المقرر
First	الفصل الدراسي
41- بنية المقرر	

University of Misan Electromagnetic Theory I
College of Science Fourth-year students
Department of Physics Syllabus (3 hours/ week)

1. Review of basic relevant mathematics
1.1 Vector Algebra
1.2 Differential calculus
1.3 Integral calculus
1.4 Coordinate systems
1.5 The Dirac Delta function
1.6 Theory of vector fields

2. Static Electric and Magnetic Field in Vacuum

2.1 Static charges
2.1.1 The electrostatic Force
2.1.2 The Electric Field
2.1.3 Gauss' Law
2.1.4 The Electric Potential
2.2 Moving Charges
2.2.1 The Continuity Equation
2.2.2 Magnetic Forces
2.2.3 The Law of Biot and Savart
2.2.4 Ampere's Law
2.2.5 The Magnetic Vector Potential
2.2.6 The Magnetic Scalar Potential

3. Charge and Current Distribution
3.1 Multipole Moments
3.1.1 The Cartesian Multipole Expansion
3.1.2 The Spherical Polar Multipole expansion
3.2 Interactions with the Field
3.2.1 Electric Dipoles
3.2.2 Magnetic Dipoles
3.3 Potential Energy

4. Slowly-Varying Fields in Vacuum
4.1 Magnetic Induction
4.1.1 Electromotive Force
4.1.2 Magnetically Induced Motional EMF
4.1.3 Time-Dependent Magnetic Fields
4 .1.4 Faraday's Law
4.2 Displacement Current
4.3 Maxwell's Equations
4.4 The Potentials
4.4.1 The Lorentz Force and Canonical Momentum
4.4.2 Gauge Transformations
4.5 The Wave Equation in Vacuum
4.5.1 Plane Waves
4.5.2 Spherical waves

5. Energy and Momentum
5.1 Energy of a Charge Distribution
5.1.1 Stationary Charges
5.1.2 Coefficients of Potential
5.1.3 Forces on Charge Distributions
5.1.4 Potential Energy of Currents
5.2 Poynting's theorem
5.3 Momentum of the Fields
5.3.1 The Cartesian Maxwell Stress Tensor
5.3.2 The Maxwell Stress Tensor and Momentum
5.4 Magnetic Monopoles
5.5 Duality Transformation

6. Static Potentials in Vacuum-Laplace's Equation

6.1 Laplace's equation
- 6.1.1 Uniqueness Theorem
- 6.1.2 $\nabla 2V = 0$ in One Dimension

6.2 $\nabla 2V = 0$ in Two Dimensions
- 6.2.1 Cartesian Coordinates in Two Dimensions
- 6.2.2 Plane Polar Coordinates
- 6.2.3 Spherical Polar Coordinates with Axial Symmetry
- 6.2.4 Conformal mappings
- 6.2.5 Schwarz - Christoffel Transformations
- 6.2.6 Capacitance
- 6.2.7 Numerical Solution

6.3 $\nabla 2V = 0$ in Three dimensions
- 6.3.1 Cylindrical Polar Coordinates
- 6.3.2 Spherical Polar Coordinates
- 6.3.3 Oblate Ellipsoidal Coordinates

Textbook: Jack Vanderlinde, Classical Electromagnetic Theory, 2nd Edition(Springer Science, 2005).
Recommended supplementary references:
(1) David J Griffiths, Introduction to Electromagnetics (Pearson, 3rd Edition, 5th Impression, 2007).
(2) J R Reitz, F J Milford, and R W Christy, Foundations of Electromagnetic Theory (Addison Wesley)
(3) Mathew N O Sadiku, Elements of Electromagnetics (Sunders College Publishing or Oxford University Press).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Mathematical Physics	اسم / رمز المقرر
First	الفصل الدراسي
42- بنية المقرر	

University of Misan — Subject: *Mathematical Physics*
College of Science — Semester: First
Department of Physics — Year: Fourth Year Physics

1- Coordinate Systems
- 1-1 Special coordinate systems,
- 1-2 circular cylinder coordinates,

1-3 orthogonal coordinates,
1-4 Spherical Polar Coordinates,
1-5 Tensor Analysis.

2- Determinants

2-1 Properties of an n-row determinant,

2-2 Expansion of second and third order determinants,

2-3 Solving the linear equation using determinants,

2-4 Some special determinants.

3- Matrices

3-1 Addition, subtraction, multiplication and inversion of matrices,

3-2 Eigenvalues and eigenvectors of real matrices,

3-3 Special matrices; rotation, orthogonal, symmetric, skew-symmetric, complex and hermitian matrices.

4- The Special Functions

4-1 Factorial function,

4-2 Definition of gamma and beta functions and their relation,

4-3 Some important formulas involving gamma and beta functions,

4-4 Error function,

4-5 Series solutions for Bessel equation (Bessel functions).

5. Power Series

5-1 The geometric series, Alternating series and telescoping series.

5-2 Convergent and divergent of series (ratio technique, integral technique).

5-3 Taylor and Maclaurin series.

5-4 Solution of differential equations by power series methods.

5-5 Legendre, Hermite and Laguerre polynomials.

6. Fourier series and Transforms
6-1 Periodic functions,
6-2 odd and even functions,
6-3 Orthogonality conditions for the sine and cosine functions.
6-4 Fourier series in complex form,
6-5 The Fourier integral and Fourier transform.
6-6 Application of Fourier transform in physical problems.

7- Laplace Transform
7-1 Laplace transform of some elementary functions.
7-2 Properties of Laplace transform- Inverse Laplace transform.
7-3 Solutions of differential equation by Laplace transform.

8- Partial Differential Equations
8-1 The diffusion or heat flow equation; heat flow in bar or slab.

8-2 The wave equation; the vibrating string.

8-3 Steady state temperature in a sphere.

8-4 Poisson's equation.

References of the course:

I. H. J. Weber and G. B. Arfken "*Essential Mathematical Methods for Physicists*" 6th Ed, ELSEVIER (2005).
II. S. Hassani "*Mathematical Methods for Students of Physics and Related Fields*" 2nd Ed, Springer (2009).
III. K.Weltner, W.J. Weber, J.G. Peter Schuster "*Mathematics for Physicists and Engineers*" Springer (2009).
IV. M.T. Vaughn "*Introduction to Mathematical Physics*" WILEY (2007).
V. B.R. Kusse and E.A. Westwig "*Mathematical Physics*" WILEY (2006).
VI. R.Wrede, M.R. Spiegel "*Theory and Problems of Advance Calculus*" Schaum's Outline Series 2nd Ed, McGRAW-HILL (2002).

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Nuclear physics I	اسم / رمز المقرر
First	الفصل الدراسي
43- بنية المقرر	

University of Misan
College of Science
Department of Physics

Subject: Nuclear physics I
Semester: First
Year: Fourth Year Physics

Syllabus (Theory 2 hours, Tutorial 1 hour, 2 units)

1- History
2- Properties of Nuclei (Basic Nuclear Concepts)

2-1 Nuclear Radii
2-2 Nuclear Mass
2-3 Nuclear Abundance
2-4 Nuclear Binding Energy
2-5 Nuclear Separation Energy
2-6 Nuclear Stability

3- Properties of Nuclear States
3-1 Nuclear Angular Momentum (Spin)
3-2 Nuclear Parity
3-3 Nuclear Magnetic and Electric Moments

4-Quantum Mechanical Description of Nuclei
4-1 Schrödinger Wave Equation
4-2 Bound States in One Dimensional Systems – Particle in a Square Well
4-3 Bound States in Three Dimensions
4-4 The Neutron-Proton System: Bound State of the Deuteron
4-5 Overview of Cross Section Calculation

5- Interaction of Radiation with Matter

5-1 Charged Particle Interactions: Stopping Power, Collision and Ionization
5-2 Charged Particle Interactions: Radiation Loss, Range
5-3 Neutron Interactions: Q-equation and Elastic Scattering

References:

I. Introductory Nuclear Physics.By Krane.
II. Nuclear Physics Concepts, By Meyerhof.
III Lecture Notes of Massachusetts Institute Technolo

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Quantum Mechanics III	اسم / رمز المقرر

First	الفصل الدراسي
44- بنية المقرر	

University of Misan Subject: Quantum Mechanics III
College of Science Semester: First
Department of Physics Year: Fourth

Syllabus(Theory 2hours, Tutorial 1 hour, 2 units)

1- Occupation number representation for the Harmonic oscillator
- 1-1- Raising and Lowering operators
- 1-2- Eigen values
- 1-3- Eigen states
- 1-4- Action of the raising and lowering operators
- 1-5- Classical limits of the motion
- 1-6- Wave functions in coordinate representation (Generating the Hermite polynomials)

2- Angular momentum operators (Ladder operators)
- 2-1- The raising and lowering operators
- 2-2- Eigen values of the angular momentum operator
- 2-3- Eigen functions of the angular momentum operator
- 2-4- Normalization of the angular momentum operator
- 2-5- The angular momentum matrices
- 2-5- The spin

3- Approximation Method I: Time independent perturbation theory
- 1-1- Non-Degenerate systems
- 1-2- Degenerate systems
- 1-3- Stark effect
- 1-4- The fine structure of Hydrogen
- 1-5- the zeeman effect
- 1-6- Hyper fine splitting

References:

14. Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
15. Modern Physics and Quantum Mechanics, E. E. Anderson
16. Introduction to quantum mechanics, Dick and Wittike
17. Introduction to quantum mechanics, D. Park

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Solid State Physics II
الفصل الدراسي	Second
45- بنية المقرر	

University of Misan Subject: Solid State Physics II
College of Science Semester: Second
Department of Physics Year: Fourth Year Physics

Syllabus

1- Band theory:
1-1 Energy levels and energy bands,
1-2 Nearly free electron model,
1-3 Bragg reflection and energy gap,
1-4 Bloch function, Kronig-Penney model, Brillouin zones,
1-5 Fermi surfaces, effective mass,
1-6 Hall effect.

2- Semiconductor crystals,
2-1 Intrinsic semiconductor,
2-2 Direct and indirect absorption ,
2-3 Intrinsic carrier concentration,
2-4 Extrinsic semiconductor,
2-5 N-type semiconductor ,
2-6 p-type semiconductor ,
2-7 Concentration of electrons and holes in dopped semiconductor ,
2-8 mobility,
2-9 electrical conductivity,
2-10 Photoconductivity,
2-11 Exciton.

3- Crystal Defect:

3-1 Point defect in a lattice,
3-2 Diffusion,
3-3 Dislocation
3-4 line imperfection,
3-5 Edge dislocation,
3-6 Screw dislocation,
3-7 Burger's vector,
3-8 dislocation movement ,
3-9 Surface defects (Planar defects),
3-10 Stacking faults,
3-11 Grain Boundaries,

3-12 Volume defects (Bulk defects).

4- Superconductivity,
4-1 Applications of Superconductivity ,
4-2 Superconducting Properties:
4-3 Critical Temperature,
4-4 Critical Magnetic field,
4-5 Critical current density,
4-6 Meissner Effect,
4-7 Penetration depth,
4-8 BCS Theory of Superconductivity Coherence length,
4-9 Types of Superconductors,
4-10 Perovskite ,
4-11 Superconductivity in high temperature superconductor.

5- Magnetic Properties of Solids, Diamagnetic materials,
5-1 Paramagnetic material,
5-2 Curie's law,
5-3 Ferromagnetic materials,
5-4 Bloch wall,
5-5 Antiferromagnetism,
5-6 Ferrimagnetisms,
5-6 Magnetic Resonance ESR(electron spin resonance) NMR (nuclear magnetic resonance).

6- Optical properties of solids

References for the courses 1 and 2 are :

I. Introduction to solid state physics C.Kittel
II. Solid State Physics, J.S.Blakemore

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Electromagnetic Theory (II)	اسم / رمز المقرر
Second	الفصل الدراسي
46- بنية المقرر	

University of Misan — Electromagnetic Theory (II)
College of Science — Fourth-year students

Department of Physics Syllabus (3 hours/ week)

1. Static Potentials with Sources–Poisson's Equation
   1.1 Poisson's Equation
   1.2 Image Charges
      1.2.1 The Infinite Conducting Plane
      1.2.2 The Conducting Sphere
      1.2.3 Conducting Cylinder and Image Line Charges
   1.3 Green's Functions
      1.3.1 Green's Theorem
      1.3.2 Poisson's Equation and Green's Theorem
      1.3.3 Expansion of the Dirichlet Green's Function in Spherical Harmonics
      1.3.4 Dirichlet Green's Function from Differential Equation

2. Static Electromagnetic Fields in Matter
   2.1 The Electric Field Due to a Polarized Dielectric
      2.1.1 Empirical Description of Dielectrics
      2.1.2 Electric Displacement Field
   2.2 Magnetic Induction Field Due to a Magnetized material
      2.2.1 Magnetic Field Intensity
   2.3 Microscopic Properties of Matter
      2.3.1 Polar Molecules (Langevin-Debye Formula)
      2.3.2 Nonpolar Molecules
      2.3.3 Dense Media—The Clausius-Mosotti Equation
      2.3.4 Crystalline Solids
      2.3.5 Simple Model of Paramagnetics and Diamagnetics
      2.3.6 Conduction
   2.4 Boundary Conditions for the Static Fields
   2.5 Electrostatics and Magnetostatics in Linear Media
      2.5.1 Electrostatics with Dielectrics Using Image Charges
      2.5.2 Image Charges for the Dielectric Cylinder
      2.5.3 Magnetostatics and Magnetic Poles
      2.5.4 Magnetic Image Poles
   2.6 Conduction in Homogeneous Matter
   2.7 Magnetic Circuits
      2.7.1 Magnetic Circuits Containing a Permanent Magnet
      2.7.2 The Hysteresis Curve of a Ferromagnet

3. Time Dependent Electric Fields in Matter
   3.1 Maxwell's equations
      3.1.1 Boundary Conditions for Oscillating Fields
      3.1.2 Special cases
   3.2 Energy and Momentum in The Fields
      3.2.1 Energy of Electric and Magnetic Fields
      3.2.2 Momentum and the Maxwell Stress Tensor
      3.2.3 Blackbody Radiation Pressure
   3.3 The Electromagnetic Potentials
   3.4 Plane Waves in Material Media
      3.4.1 Plane waves in Linear, Isotropic Dielectrics
      3.4.2 Reflection and Refraction—Snell's Law
      3.4.3 Fresnel's Equations

3.4.4 The Evanescent wave
3.4.5 Plane waves in a Tenuous Plasma
3.4.6 Plane Waves in Linear Anisotropic Dielectrics
3.4.7 Plane waves in Isotropic, Linear Conducting matter
3.4.8 Simple model for the Frequency Dependence of Dielectric Susceptibility
3.4.9 Simple Model of a Conductor in an Oscillating Field

4. Waveguide Propagation – Bounded waves
4.1 Bounded Waves
4.1.1 TE Modes in a Rectangular Waveguide
4.2 Cylindrical Waveguides
4.2.1 Circular Cylindrical Waveguides
4.2.2 Resonant Cavities
4.2.3 Dissipation by Eddy Currents
4.3 Dielectric Waveguides (Optical Fibers)
4.3.1 HE Modes

5. Electromagnetic Radiation
5.1 The Inhomogeneous Wave Equation
5.1.1 Solution by Fourier Analysis
5.1.2 Green's Function for the Inhomogeneous Wave Equation
5.2 Radiation from a Localized Oscillating Source
5.2.1 Electric Dipole Radiation
5.2.2 Magnetic Dipole and Electric Quadrupole Radiation
5.2.3 Radiation by Higher Order Moments
5.2.4 Energy and Angular Momentum of the Multipole Fields
5.2.5 Radiation from Extended Sources
5.3 The Li´enard-Wiechert Potentials
5.3.1 The Li´enard-Wiechert Potentials Using Green's Functions
5.3.2 The Fields Of a Moving Charge
5.3.3 Radiation from Slowly Moving Charges
5.3.4 Thompson Scattering
5.3.5 Radiation by Relativistic Charges
5.3.6 Synchrotron Radiation
5.3.7 Bremstrahlung and Cherenkov radiation
5.4 Differentiating the Potentials

Textbook: Jack Vanderlinde, Classical Electromagnetic Theory, 2nd Edition(Springer Science, 2005).
Recommended supplementary references:
(1) David J Griffiths, Introduction to Electromagnetics (Pearson, 3rd Edition, 5th Impression, 2007).
(2) J R Reitz, F J Milford, and R W Christy, Foundations of Electromagnetic Theory (Addison Wesley)
(3) Mathew N O Sadiku, Elements of Electromagnetics (Sunders College Publishing or Oxford University Press).

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Nuclear physics II
الفصل الدراسي	Second
47- بنية المقرر	

University of Misan Subject: Nuclear physics II
College of Science Semester: Second2
Department of Physics Year: Fourth Year Physics

Syllabus

1- Nuclear Models
1-1 Liquid – Drop Model
1-2 The Semi – Empirical Mass Formula
1-3 Fermi – Gas Model
1-4 Simple Shell Model
1-5 Spin – Orbit Potential

2- Decay processes
2-1 Natural Radioactivity
2-2 α – Decay
2-3 β – Decay
2-4 γ – Decay

3- Nuclear Reactions
3-1 Introduction to Nuclear Reactions
3-2 Compound Nucleus
3-3 Pre – Equilibrium Reactions
3-4 Direct Reactions (Optical Model)
3-5 Fission Reaction
3-6Fusion Reaction

References for courses 1 and 2 are :

III. Introductory Nuclear Physics.By Krane.
IV. Nuclear Physics Concepts, By Meyerhof.
III Lecture Notes of Massachusetts Institute Technolo

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Quantum Mechanics III
الفصل الدراسي	Second
48- بنية المقرر	

University of Misan Subject: Quantum Mechanics III
College of Science Semester: Second2
Department of Physics Year: Fourth Year Physics

Syllabus

1- Review
2- Operators;
3- Commutation of Operators(C.O.);
4- Eigen functions of C.O.
5- Hermitian Operators;
6- Real Eigen Values & Orthogonal W.F.s of Hermitian Operators
7- Expansion of a wave function;
8- Orthogonality of W.F.s of Schrodinger Eq.
9- Degeneracy; 3 – Dimensional Box & H – Atom as Examples
10- Dirac Symbolic Method (Raisin & Lowering Operators Method to Solve The Harmonic Oscillator Problem
11- Energy Levels of The Harmonic Oscillator
12- Wave functions of The Harmonic Oscillator
13- Vibration of Diatomic molecules
14- Dimensional Harmonic Oscillator
15- Commutation of Operators and The General Angular Momentum M (Operators Treatment)
16- Raising & Lowering Operators
17- Examination
18- $M^2 = J(J+1)\,\hbar^2$, J = 0, 1, 2, …;or ½ , 3/2, 5/2, …; $M_z = M_J\,\hbar$, $M_J = 0, \pm1, \pm2\ldots, \pm J$
19- Examples: Orbital Angular momentum of H- Atom and spin angular Momentum
20- Average values of components of angular momentum

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Nuclear physics IV
الفصل الدراسي	Second
49- بنية المقرر	

University of Misan Subject: Nuclear physics IV
College of Science Semester: Second
Department of Physics Year: Fourth Year Physics

1- Spin Angular Momentum Operators
2- Eigen Functions & Eigen Values of Angular Momentum Operators
3- Programmed Examination
4- The Variation Method
5- Time-Independent Perturbation Theory (TIPTh) for non- degenerate case,
6- (TIPTh) for degenerate case. Examples,
7- Time-Dependent Perturbation Theory,
8- Examples: S.H. Oscillator & H- Atom
9- Matrix formulation of Quantum Mechs
10- Eigen values & E. functions of matrices of spin operators
11- Identical Particles
12- Pauli Principle; Singlet and Triplet States of two particle system
13- Examination
14- General Uncertainty Principle
15- Programmed Examination

References for course III and IV are :

1- Introduction to Quantum Theory – D. Park
2- Basic Q.M.- R. White,
3- Q. Theory- D. Bohm,
4- Introduction to Q. Mechanics- Dicke & Wittke,
5- Quantum Mechanics- L.I. Schiff.

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Plasma
الفصل الدراسي	first
-50 بنية المقرر	

University of Misan — Subject: Plasma
College of Science — Course: 1
Department of Physics — Year: Fourth

Syllabus

1- What is plasma?, plasma as state of matter, and Historical summery.
2- Ionization and recombination,
2-1 Saha equation, self and non-self discharges,
2-2 Paschen's law and Paschen curve.
3- The ideal plasma,
3-1 Debye shielding,
3-2 Plasma parameter,
3-3 The criteria for plasmas,
3-4 The concept of temperature
4- Laboratory plasmas:
4-1 plasma generation methods,
4-2 plasma diagnostic techniques
5- Plasma as collection of individual particles: Single particle motions in uniform fields.
6- Single particle motions in non- uniform fields.
7- Magnetic Mirrors.
8- Discussion.
9- Examination.
10- Plasma as fluid:
10-1 The fluid equation of motion,
10-2 Comparison with ordinary hydrodynamics,
11- The equation of continuity,
11-1 The equation of state,
11-2 the complete set of fluid equations.
12- Fluid drifts
13- The plasma approximation.
14- Discussion.
15- Examination.

References for course is:

I. Introduction to Plasma Physics and Controlled Fusion by F.F. Chen, 1985.

II. Physics of Ionized Gases, by B. M. Smirnov, 2001.
III. Plasma Physics: An Introduction Course, by R. Dendy, 1999.
IV. Introduction to Plasma Physics, by R. Fitz Partik.

University of misan College of Science	المؤسسة التعليمية
Department of Physics	القسم العلمي / المركز
Solid State Physics I	اسم / رمز المقرر
first	الفصل الدراسي
-51 بنية المقرر	

University of Misan — Subject: Solid State Physics I
College of Science — Course: 1
Department of Physics — Year: Fourth

Syllabus

2- Crystal structure-
1-1 Basis, Lattice crystal translation vector and lattice-symmetry operations
1-2 two dimensional lattice type-three dimensional lattice type
1-3 Miller indices, the indices of a direction, Position in the cell
1-4 simple crystal structure (Sodium chloride structure, Cesium chloride structure
1-5 Close-packed structure-Diamond structure, Zinc Sulfide structure).

2- Crystal diffraction and the reciprocal lattice
2-1 Bragg law-Experimental diffraction methods
2-2 Laue method-rotating crystal method-powder method
2-3 reciprocal lattice-Brilloun zones
2-4 structure factor of the basis.

3- Crystal Binding-crystal of Inert gases
3-1 Vander Waals
3-2 London interaction
3-3 equilibrium lattice constants
3-4 Cohesive energy
3-4 Repulsive interaction
3-5 Compressibility and Bulk modulus
3-6 Ionic crystal
3-7 Madelung energy
3-8 Covalent crystal
3-9 Metal crystal
3-10 Hydrogen
3-11-bonded crystal
3-12 Atomic radii,

4- Phonons and Lattice vibrations

4-1 phonon Momentum

4-2 Inelastic scattering of photons by long wavelength phonons

4-3 Inelastic scattering of neutrons by phonons

4-4 Vibration of monatomic lattices-group velocity

4-5 phase velocity

4-6 Vibrational modes of Lattice with two atoms per primitive cell-Local phonon modes.

5- Thermal properties of solids

5-1 Lattice heat capacity

5-2 Classical model for specific heat

5-3 Einstein model

5-4 Density of modes in one dimension

5-5 Density of modes in three dimensions

5-6 Debye model of the lattice heat capacity, Anharmonic crystal interactions

5-7 thermal expansion-thermal conductivity

5-8 Lattice thermal resistivity

5-9 Normal and Umklapp processes.

6- Free electron model

6-1 classical free electron theory

6-2 Drude model-Lorentz model

6.3Thermal conductivity for free electron gas,

7- Quantum free electron model

7-1 energy levels and density of state in one dimension-free electron gas in three dimensions

7-2 density of state for free electron gas in three dimensions

7-3 -Somerfield's model for metallic conduction

7-4 electrical conductivity,

المؤسسة التعليمية	University of misan College of Science
القسم العلمي / المركز	Department of Physics
اسم / رمز المقرر	Solid State Physics II
الفصل الدراسي	second
52- بنية المقرر	

University of Misan — Subject: Solid State Physics II
College of Science — Course: 2
Department of Physics — Year: Fourth

Syllabus

1- Band theory:
- 1-1 Energy levels and energy bands,
- 1-2 Nearly free electron model,
- 1-3 Bragg reflection and energy gap,
- 1-4 Bloch function, Kronig-Penney model, Brillouin zones,
- 1-5 Fermi surfaces, effective mass,
- 1-6 Hall effect.

2- Semiconductor crystals,
- 2-1 Intrinsic semiconductor,
- 2-2 Direct and indirect absorption ,
- 2-3 Intrinsic carrier concentration,
- 2-4 Extrinsic semiconductor,
- 2-5 N-type semiconductor ,
- 2-6 p-type semiconductor ,
- 2-7 Concentration of electrons and holes in dopped semiconductor ,
- 2-8 mobility,
- 2-9 electrical conductivity,
- 2-10 Photoconductivity,
- 2-11 Exciton.

3- Crystal Defect:

- 3-1 Point defect in a lattice,
- 3-2 Diffusion,
- 3-3 Dislocation
- 3-4 line imperfection,
- 3-5 Edge dislocation,
- 3-6 Screw dislocation,
- 3-7 Burger's vector,
- 3-8 dislocation movement ,

3-9 Surface defects (Planar defects),
3-10 Stacking faults,
3-11 Grain Boundaries,
3-12 Volume defects (Bulk defects).

4- Superconductivity,
4-1 Applications of Superconductivity ,
4-2 Superconducting Properties:
4-3 Critical Temperature,
4-4 Critical Magnetic field,
4-5 Critical current density,
4-6 Meissner Effect,
4-7 Penetration depth,
4-8 BCS Theory of Superconductivity Coherence length,
4-9 Types of Superconductors,
4-10 Perovskite ,
4-11 Superconductivity in high temperature superconductor.

5- Magnetic Properties of Solids, Diamagnetic materials,
5-1 Paramagnetic material,
5-2 Curie's law,
5-3 Ferromagnetic materials,
5-4 Bloch wall,
5-5 Antiferromagnetism,
5-6 Ferrimagnetisms,
5-6 Magnetic Resonance ESR(electron spin resonance) NMR (nuclear magnetic resonance).

6- Optical properties of solids

References for the courses 1 and 2 are :

I. Introduction to solid state physics C.Kittel
II. Solid State Physics, J.S.Blakemore